RGPVNOTES.IN

Program : **B.Tech**

Subject Name: **Remote Sensing and GIS**

Subject Code: **CE-504**

Semester: **5th**

Syllabus

Integrated Applications of Remote sensing and GIS: Applications in land use land coveranalysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management. Location Based Services And Its Applications.

Principle

The land-use and land-cover pattern of a region is an outcome of natural and socio-economic factors and their utilization by man in time and space. Land-use and land-cover change has become a central component in current strategies in managing natural resources and monitoring environmental changes. Urban expansion has increased the exploitation of natural resources and has changed land use and land cover patterns. Rapid urbanization, therefore, brings opportunities for new urban developments, however, it also has brought serious losses of arable land, forest land and water bodies. Land cover change is a major concern of global environment change. The modelling and projecting of land cover change is essential to the assessment of consequent environmental impacts.

Applications in land use land cover analysis

Remote sensing systems and satellite data resources

Three distinct stages of the development of remote sensing (RS) instruments are illustrated in Fig. 1. The first generation RS instruments were of low spatial resolution, 1 km–100 m, increasing to 30–10 m in the second generation. The third generation instruments are more capable in observing the Earth's surface with a very high spatial resolution, 5–0.5 m and less, enabling the acquisition of further spatial details—resulting in more accurate feature recognition. To enable the reader to gain a high-level overview of RS characteristics, we categorised the satellites based on their orbit; sensor mode and instrument; resolution; and wavelength of electromagnetic radiation (EMR), as shown in Fig. 2.

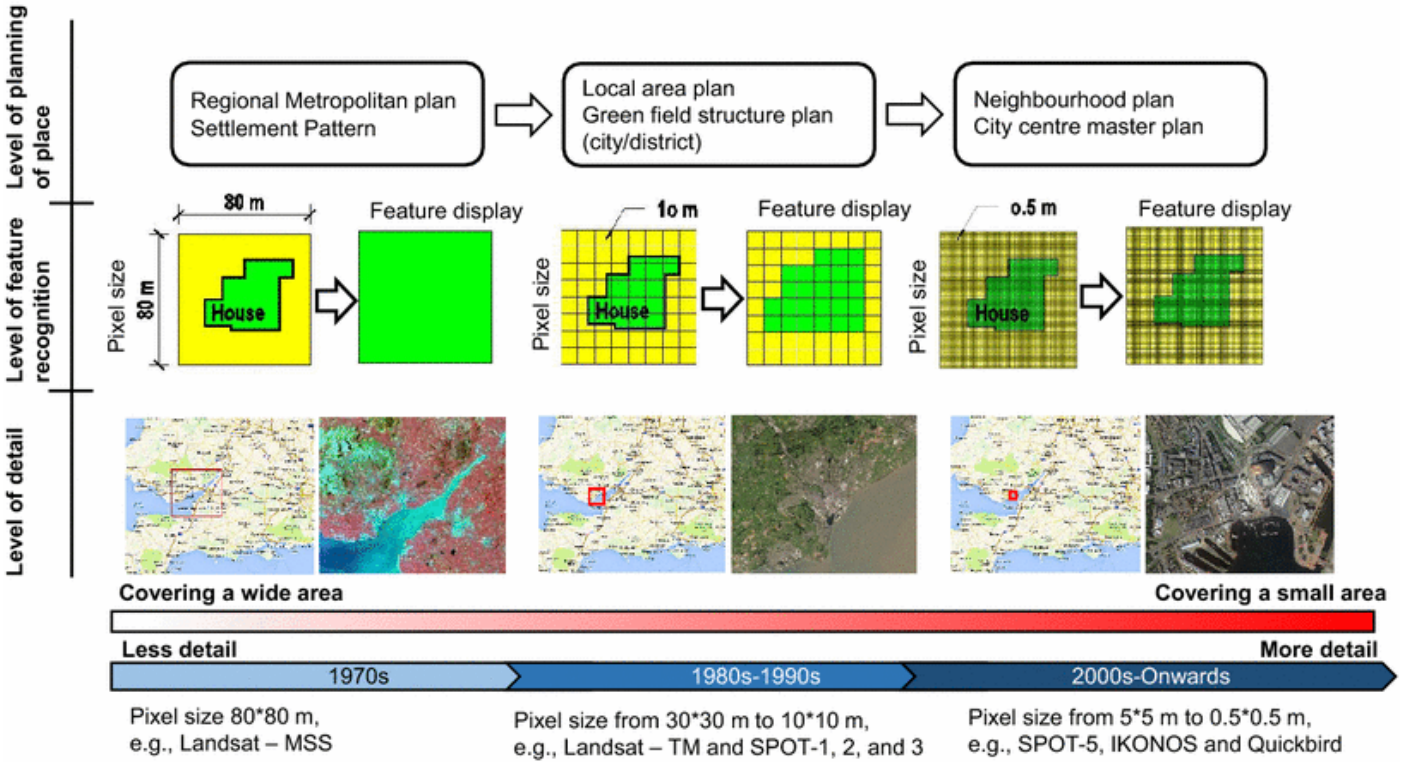

Fig. 1

A comparison of satellite generations in terms of detail, feature recognition and planning requirements. The red square represents the spatial resolution of the adjacent RS image. An image with a pixel size of 80 m (Landsat-MSS) cannot recognise an object, such as a house but its features can be effectively recognised with a pixel size of 0.6 m (QuickBird)

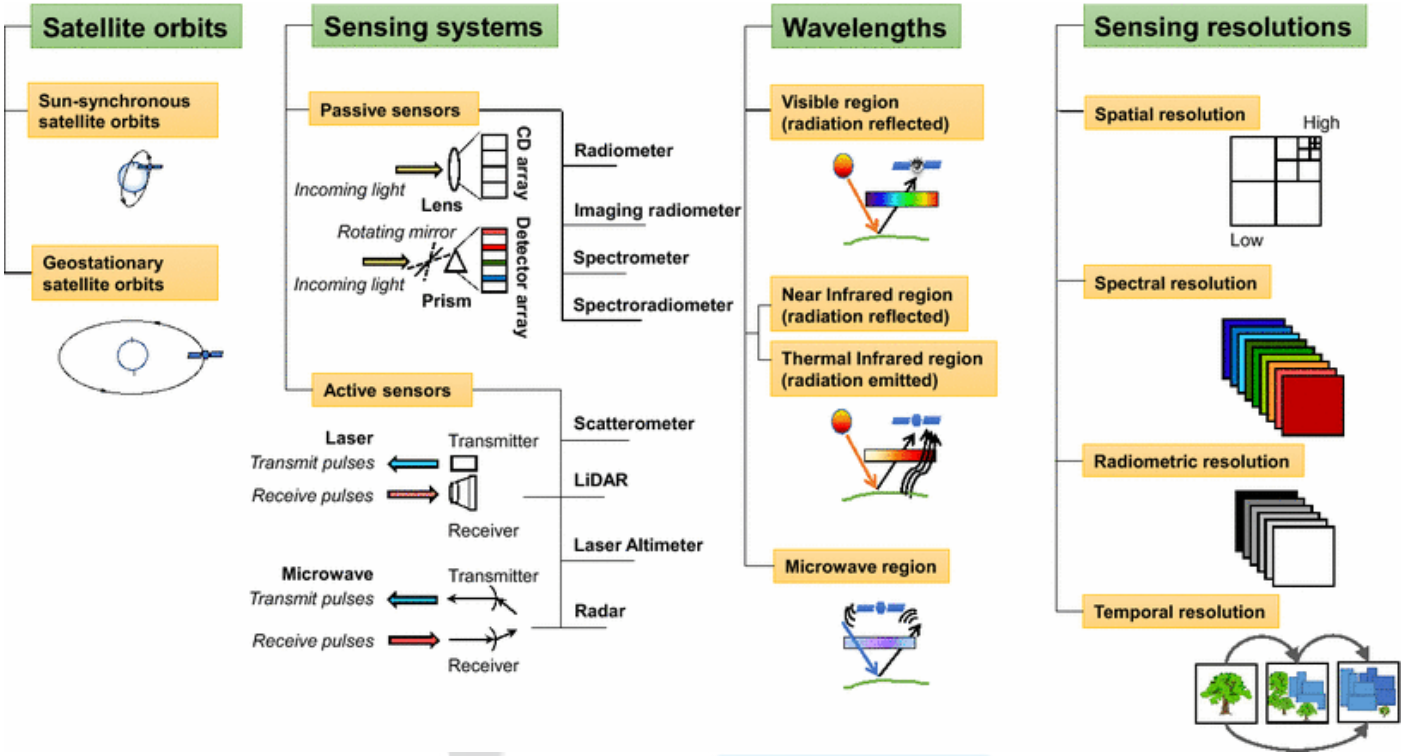

Fig. 2

Classification of remote sensing sensors based on their characteristics

Remote sensing of urban environments and environmental planning

Cities are unique because of the existence of dense artificial structures. The increasing urbanisation rate will eventually lead to the expedited consumption of non-renewable land resources such as water (on- and under-ground) and food, and energy resources such as oil, coal and gas—with environmental, social and economic impact on developing and developed countries alike. Thus, the growth of urban areas can result in substantial land-cover and land-use changes—an ideal sustainability use case for the use of remote sensing. The next sections are devoted to review of remote sensing applications within urban environments, focussing on urban growth, sprawl and change; environmental impacts of urban growth; and sustainable energy applications.

Urban growth, sprawl and change

Urban growth refers to the transformation of the landscape from undeveloped to developed land. More specifically, the growth away from central urban areas into homogeneous, low-density and typically car-dependent communities is often referred to as urban/suburban *sprawl*. In developing countries, urban sprawl can be unplanned and uncontrolled. Consequently, urban growth leads to the loss of farmland, gives rise to economic and social issues, and increases water and energy consumption, and associated greenhouse gas emissions.

Environmental impacts of urban growth

At a time when informal settlements are emerging as a result of population growth, the likelihood of increasing the occupation of spaces inside and outside cities will be higher, as is the risk of inappropriate urbanisation. The occupation of land as an uncoordinated form is motivated by several factors, namely: limited income of urban dwellers; increased housing demand; the lack of sustainable long-term urban planning; and the insufficiency of legal buildable land. These factors have led to the improper development of cities/urban areas, even in areas considered at high risk from natural disasters such as landslide and flooding. The negative effects of the expansion of cities and urban growth are more motivational as a research agenda than the positive ones.

water resources

Water has very low spectral reflectance in the visible part of the Electro Magnetic Region (EMR) whereas snow or ice has very high spectral reflectance in visible and near infrared (NIR) part of the EMR. Pure water absorbs nearly all incident energy in both the near infrared and middle infrared (MIR) wavelengths. The low reflectance of water in visible and NIR band has advantage in Remote Sensing as water becomes clearly distinguishable from either vegetation or soil cover throughout the reflective infrared portion.

Application of visual and digital Remote Sensing techniques and integration of the remotely sensed data in specific layers through the Geographic Information System (GIS) are used by scientists in management of water resources and prediction of natural water related hazards like flood and drought. Visual Remote Sensing has been extensively used in detection of water pollution, lake eutrophication assessment and estimation of flood damage. The technique of visual image interpretation can be used in variety of ways to help monitor water quantity, quality and geographic distribution of water resources.

Application of GIS in natural resource management

The major application of GIS in natural resource management is in confronting with environmental issues like a flood, landslide, soil erosions, drought, earthquake etc. GIS in natural resource management also address the current problems of climate change, habitat loss, population growth, pollution etc. The solution to these problems is the application of GIS in natural resource management. Yes, introduction to GIS has solved many problems related to the natural environment. GIS is a powerful tool that is used in the management of natural resources. Some applications of GIS in major fields are discussed below:

Hazard and risk assessment

GIS in natural resource management is used in the reduction of a natural hazard such as flood, landslide, soil erosion, forest fires, earthquake, drought etc. One cannot totally stop these natural disasters but can minimize these warnings by early planning, preparation, and strategies. GIS in natural resource management is being used in analyzing, organizing, managing and monitoring the natural hazards. GIS in natural resource management provides a spatial data of the disasters that have taken place before or might to occur so that early risk can be prevented. It is indicated through GIS-based map.

Change detection

GIS in natural resource management provides information about land area change between time periods. The land change documents detected through satellite imagery or aerial photographs. It is a useful application in land change, deforestation assessment, urbanization, habitat fragmentation etc. The information obtained from GIS in natural resource management help to study the specific area and monitoring can be done in and around the area. It is a way of studying the variations taking place in landscape and managing the environment.

Environmental Monitoring

GIS in natural resource management provides a graphical data that helps in monitoring the environment. It determines the qualitative and quantitative data about the environment issues such as pollution, land degradation, soil erosions etc. GIS in natural resource management detects these problems and predicts the future hazards. Thus, GIS in natural resource management monitors all these environment problems.

Traffic management

Graphical Information Systems, or GIS, represent the modern entry of multi-discipline fields in subject areas like computer science, surveying, geography, and cartography into statistical analysis and the management of transportation systems. GIS is based on geographical spatial information, adopting the geographical prototype analytic technique and extending many sorts of spatial and dynamic geographic data. It is a computer-driven high-tech arrangement that provides for geographical exploration and geographic decisiveness.

Highway designers have for years obstinately maintained that forevermore designing and building new roads will serve to reduce traffic in densely populated urban areas. Sadly, the result in most cases has turned out to be provisional. London's M25 orbital throughway is an example. In the late sixties when it was designed, engineers assumed it would relieve traffic blockages in and around London. Unfortunately, the beltway brought more motorists into the central city from outlying areas, and the effect was to worsen congestion, not relieve it.

GIS has proved to be a constructive adjunct when envisioning the effect that traffic on roadways and for proposed new construction has on the environment. Differences of opinion that crop up can be seen openly, and different alternatives can be searched more effortlessly than on a paper map. Using GIS for 3D visual imaging may also facilitate solving disagreements that frequently take place when people from different engineering fields work together on a large project. Alterations in design can be made earlier than when the actual trouble evidences itself on-the-spot.

GIS has a wide variety of applications in road traffic direction and traffic planning, as well as other spheres in transportation networks. On the other hand, GIS is not used unaided, but with other sophisticated techniques such as transport telemetric and intelligent transportation systems. Altogether, GIS is a bonus to all sorts of traffic direction; the blending of GIS with other schemes is perhaps the best principal potential for the expectations of GIS.

Location Based Services and Location Identification:

This technique is used to find a location for a new retail outlet. It helps to find out what exists at a particular location. A location can be described in many ways, using, for instance, name of place, post code, or geographic reference such as longitude or latitude or X/Y.

Other GIs Applications

1. GIS in Mapping: **Mapping is a central function of Geographic Information System, which provides a visual interpretation of data. GIS store data in database and then represent it visually in a mapped format. People from different professions use map to communicate. It is not necessary to be a skilled cartographer to create maps. Google map, Bing map, Yahoo map are the best example for web based GIS mapping solution.**

2. Telecom and Network services: **GIS can be a great planning and decision making tool for telecom industries. GDi GISDATA enables wireless telecommunication organizations to incorporate geographic data in to the complex network design, planning, optimization, maintenance and activities. This technology allows telecom to enhance a variety of application like engineering application, customer relationship management and location based services.**

3. Accident Analysis and Hot Spot Analysis: **GIS can be used as a key tool to minimize accident hazard on roads, the existing road network has to be optimized and also the road safety measures have to be improved. This can be achieved by proper traffic management. By identifying the accident locations, remedial measures can be planned by the district administrations to minimize the accidents in different parts of the world. Rerouting design is also very convenient using GIS.**

4. Urban Planning: **GIS technology is used to analyze the urban growth and its direction of expansion, and to find suitable sites for further urban development. In order to identify the sites suitable for the urban growth, certain factors have to consider which is: land should have proper accessibility, land should be more or less flat, land should be vacant or having low usage value presently and it should have good supply of water.**

5. Transportation Planning: **GIS can be used in managing transportation and logistical problems. If transport department is planning for a new railway or a road route then this can be performed by adding environmental and topographical data into the GIS platform. This will easily output the best route for the transportation based on the criteria like flattest route, least damage to habitats and least disturbance from local people. GIS can also help in monitoring rail systems and road conditions.**

6. Environmental Impact Analysis: **EIA is an important policy initiative to conserve natural resources and environment. Many human activities produce potential adverse environmental effects which include the construction and operation of highways, rail roads, pipelines, airports, radioactive waste disposal and more. Environmental impact statements are usually required to contain specific information on the magnitude and characteristics of environmental impact. The EIA can be carried out efficiently by the help of GIS, by integrating various GIS layers, assessment of natural features can be performed.**

7. Agricultural Applications: **GIS can be used to create more effective and efficient farming techniques. It can also analyze soil data and to determine: what are the best crop to plant?, where they should go? how to maintain nutrition levels to best benefit crop to plant?. It is fully integrated and widely accepted for helping government agencies to manage programs that support farmers and protect the environment. This could increase food production in different parts of the world so the world food crisis could be avoided.**

8. Disaster Management and Mitigation: **Today a well-developed GIS systems are used to protect the environment. It has become an integrated, well developed and successful tool in disaster management and mitigation. GIS can help with risk management and analysis by displaying which areas are likely to be prone to natural or man-made disasters. When such disasters are identified, preventive measures can be developed.**

9. Landslide Hazard Zonation using GIS: **Landslide hazard zonation is the process of ranking different parts of an area according to the degrees of actual or potential hazard from landslides. The evaluation of landslide hazard is a complex task. It has become possible to efficiently collect, manipulate and integrate**

a variety of spatial data such as geological, structural, surface cover and slope characteristics of an area, which can be used for hazard zonation. The entire above said layer can well integrate using GIS and weighted analysis is also helpful to find Landslide prone area. By the help of GIS we can do risk assessment and can reduce the losses of life and property.

10. Determine land use/land cover changes: **Land cover means the feature that is covering the barren surface .Land use means the area in the surface utilized for particular use. The role of GIS technology in land use and land cover applications is that we can determine land use/land cover changes in the different areas. Also it can detect and estimate the changes in the land use/ land cover pattern within time. It enables to find out sudden changes in land use and land cover either by natural forces or by other activities like deforestation.**

11. Navigation (routing and scheduling): **Web-based navigation maps encourage safe navigation in waterway. Ferry paths and shipping routes are identified for the better routing. ArcGIS supports safe navigation system and provides accurate topographic and hydrographical data. Recently DNR, s Coastal Resources Division began the task of locating, documenting, and cataloging these no historic wrecks with GIS. This division is providing public information that make citizens awareness of these vessel locations through web map. The web map will be regularly updated to keep the boating public informed of these coastal hazards to minimize risk of collision and injury.**

12. Flood damage estimation: **GIS helps to document the need for federal disaster relief funds, when appropriate and can be utilized by insurance agencies to assist in assessing monetary value of property loss. A local government need to map flooding risk areas for evaluate the flood potential level in the surrounding area. The damage can be well estimate and can be shown using digital maps .**

13. Natural Resources Management: **By the help of GIS technology the agricultural, water and forest resources can be well maintain and manage. Foresters can easily monitor forest condition. Agricultural land includes managing crop yield, monitoring crop rotation, and more. Water is one of the most essential constituents of the environment. GIS is used to analyze geographic distribution of water resources. They are interrelated, i.e. forest cover reduces the storm water runoff and tree canopy stores approximately 215,000 tons carbon. GIS is also used in afforestation.**

14. GIS Solutions in Banking Sector: **Today rapid development occurs in the banking sector. So it has become more market driven and market responsive. The success of this sector largely depends on the ability of a bank to provide customer and market driven services. GIS plays an important role providing planning, organizing and decision making.**

15. Soil Mapping : **Soil mapping provides resource information about an area. It helps in understanding soil suitability for various land use activities. It is essential for preventing environmental deterioration associated with misuse of land. GIS Helps to identify soil types in an area and to delineate soil boundaries. It is used for the identification and classification of soil. Soil map is widely used by the farmers in developed countries to retain soil nutrients and earn maximum yield.**

16. GIS based Digital Taxation: **In Local Governments, GIS is used to solve taxation problems. It is used to maximize the government income. For example, for engineering, building permits, city development and other municipal needs, GIS is used. Often the data collected and used by one agency or department can be used by another. Example Orhitec ltd can supply you with a system to manage property tax on a geographic basis that can work interactively with the municipal tax collection department. Using GIS we can develop a digital taxation system.**

17. Land Information System: **GIS based land acquisition management system will provide complete information about the land. Land acquisition managements is being used for the past 3 or 4 years only. It would help in assessment, payments for private land with owner details, tracking of land allotments and possessions identification and timely resolution of land acquisition related issues.**

18. Surveying: **Surveying is the measurement of location of objects on the earth's surfaces. Land survey is measuring the distance and angles between different points on the earth surface. An increasing number of national and governments and regional organizations are using GNSS measurements. GNSS is used for topographic surveys where a centimeter level accuracy is provided. These data can be incorporated in the GIS system. GIS tools can be used to estimate area and also, digital maps can prepared.**

19. Wetland Mapping: **Wetlands contribute to a healthy environment and retain water during dry periods, thus keeping the water table high and relatively stable. During the flooding they act to reduce flood levels and to trap suspended solids and attached nutrients. GIS provide options for wetland mapping and design projects for wetland conservation quickly with the help of GIS. Integration with Remote Sensing data helps to complete wetland mapping on various scale. We can create a wetland digital data bank with spices information using GIS.**

20. GIS Applications in Geology: **Geologists use GIS in a various applications. The GIS is used to study geologic features, analyze soils and strata, assess seismic information, and or create three dimensional (3D) displays of geographic features. GIS can be also used to analyze rock information characteristics and identifying the best dam site location.**

21. Detection of Coal Mine Fires: **GIS technology is applied in the area of safe production of coal mine. Coal mine have developed an information management system, the administrators can monitor the safe production of coal mine and at the same time improve the abilities to make decisions. Fire happens frequently in coal mines. So it can assessed spontaneous combustion risk using GIS tools.(Kun Fang, GIS Network Analysis in Rescue of Coal Mine)**

22. Assets Management and Maintenance: **GIS helps organizations to gain efficiency even in the face of finite resources and the need to hold down the cost. Knowing the population at risk enables planners to determine where to allocate and locate resources more effectively. Operations and maintenance staff can deploy enterprise and mobile workforce. GIS build mobile applications that provide timely information in the field faster and more accurate work order processing.**

23. GIS for Planning and Community Development: **GIS helps us to better understand our world so we can meet global challenges. Today GIS technology is advancing rapidly, providing many new capabilities and innovations in planning. By applying known part of science and GIS to solve unknown part, that helps to**

enhance the quality of life and achieve a better future. Creating and applying GIS tools and knowledge allow us integrating geographic intelligence into how we think and behave.

24. GIS in Dairy Industry: **Geographic Information System is used in a various application in the dairy industry, such as distribution of products, production rate, location of shops and their selling rate. These can be monitored by using GIS system. It can be also possible to understand the demand of milk and milk products in different region. GIS can prove to be effective tool for planning and decision making for any dairy industry. These advantages has added new vistas in the field of dairy farm and management.**

25. Tourism Information System: **GIS provides a valuable toolbox of techniques and technologies of wide applicability to the achievement of sustainable tourism development. This provide an ideal platform tools required to generate a better understanding, and can serve the needs of tourists. They will get all the information on click, measure distance, find hotels, restaurant and even navigate to their respective links. Information plays a vital role to tourists in planning their travel from one place to another, and success of tourism industry. This can bring many advantages for both tourist and tourism department.**

26. Irrigation water management: **Water availability for irrigation purposes for any area is vital for crop production in that region. It needs to be properly and efficiently managed for the proper utilization of water. To evaluate the irrigation performance, integrated use of satellite remote sensing and GIS assisted by ground information has been found to be efficient technique in spatial and time domain for identification of major crops and their conditions, and determination of their areal extent and yield. Irrigation requirements of crop were determined by considering the factors such as evapotranspiration, Net Irrigation Requirement, Field irrigation Requirement, Gross Irrigation Requirement, and month total volume of water required, by organizing them in GIS environment. (A. M. Chandra, S. K. Ghosh, Remote Sensing and Geographical Information System)**

27. Fire equipment response distance analysis: **GIS can be used to evaluate how far (as measured as via the street network) each portion of the street network is from a firehouse. This can be useful in evaluating the best location for a new firehouse or in determining how well the fire services cover particular areas for insurance ratings.(Himachal Pradesh, Development Report)**

28. Worldwide Earthquake Information System: **One of the most frightening and destructive phenomena of nature is the occurrence of an earthquake. There is a need to have knowledge regarding the trends in earthquake occurrence worldwide. A GIS based user interface system for querying on earthquake catalogue will be of great help to the earthquake engineers and seismologists in understanding the behaviour pattern of earthquake in spatial and temporal domain. (A. M. Chandra, S. K. Ghosh Remote Sensing and Geographical Information System)**

29. Volcanic Hazard Identification: **Volcanic hazard to human life and environment include hot avalanches, hot particles gas clouds, lava flows and flooding. Potential volcanic hazard zone can be recognized by the characteristic historical records of volcanic activities, it can incorporate with GIS. Thus an impact assessment study on volcanic hazards deals with economic loss and loss of lives and property in densely populated areas. The GIS based platforms enables us to find out the damage and rapid response against volcanic activities may helps to reduce the effect in terms of wealth and health of people.**

30. Energy Use Tracking and Planning: **GIS is a valuable tool that helps in the planning organizing and subsequent growth in the energy and utilities industries. The effective management of energy systems is a complex challenge. GIS has enormous potential for planning, design and maintenance of facility. Also it provide improved services and that too cost effectively.**

31. GIS for Fisheries and Ocean Industries: **GIS tools add value and the capability to ocean data. ArcGis is used to determine the spatial data for a fisheries assessment and management system. It is extensively used in the ocean industry area and we get accurate information regarding various commercial activities. To enhance minimizing cost for the fishing industry. Also it can determine the location of illegal fishing operations.**

32. Monitor Rangeland Resources: **GIS is a valuable tool used to monitor the changes of rangeland resource and for evaluating its impact on environment, livestock and wild life. Accurate observation and measurements are to be made to find out the changes in the rangeland conditions. GIS is also used to monitoring ecological and seasonal rangeland conditions .**

33. Reservoir Site Selection: **GIS is used to find a suitable site for the dam. GIS tries to find best location that respect to natural hazards like earthquake and volcanic eruption. For the finding of dam site selection the factors include economic factors, social considerations, engineering factors and environmental problems. This all information are layered in the GIS.**

34. Forest Fire Hazard Zone Mapping: **Forest is one of the important element of the nature. It plays an important role in the local climate. Forest fires caused extensive damage to our communities and environmental resource base. GIS can effectively use for the forest fire hazard zone mapping and also for the loss estimation. GIS also help to capture real time monitoring of fire prone areas. This is achieved by the help of GNSS and satellite Remote Sensing.**

35. Pest Control and Management: **Pest control helps in the agricultural production. Increasing in the rate of pest and weeds can lead to decrease in the crop production. Therefore GIS plays an important role to map out infested areas. This leads in the development of weed and pest management plan.**

36. Traffic Density Studies: **GIS can effectively use for the management of traffic problems. Today's population along with the road traffic is increasing exponentially. The advantage of GIS make it an attractive option to be used to face the emerging traffic problems. By creating an extensive database that has all the traffic information such as speed data, road geometry, traffic flow and other spatial data and processing this information will provide us the graphical bigger picture for the traffic management.**

37. Deforestation: **Nowadays forest area is decreasing every year, due to different activities. GIS is used to indicate the degree of deforestation and vital causes for the deforestation process. GIS is used to monitor deforestation.**

38. Space Utilization: **GIS helps managers to organize and spatially visualize space and how it can best be used. Operational costs can be decreased by more efficiently using space including managing the moves of personal and assets as well as the storage materials. The 3D visualization in GIS platforms helps planers to create a feeling of experience like virtual walk inside the building and rooms before construction.**

39. Desertification: **Desertification is the land degradation due to climatic variations or human activities. GIS can provide the information of degraded land which can be managed by governmental agencies or by the communities themselves. GIS plays a vital role to reduce the desertification, the local governments are now widely depends on GIS for reducing desertification. With location based GIS analysis we can find where or which area is suitable for planting new vegetation and which area for the pipeline construction.**

40. Disaster and Business Continuity Planning: **Viewing building and locations assets along with emergency information such as weather patterns, and disaster zones, can provide organizations the required information to make better decision. GIS provide holistic understanding of facility status and performance, and brings together department, business systems, and data source for a comprehensive view into and throughout the organization. (Faisal I. Al-Shukri, GIS Utilization in Facility Management)**

41. GIS for Business: **GIS is also used for managing business information based on its location. GIS can keep a track of where the customers are located, site business, target marketing campaigns, and optimize sales territories and model retail spending patterns. Such an added advantage is provided by the GIS to enhance in making companies more competitive and successful. (Sita Mishra, GIS in Indian Retail Industry-A Strategic Tool)**

42. Utilities: **The GIS is used for different type of utilities like electricity, telecom and cooking gas on a daily basis and utilities to help them in mapping, in inventory systems, track maintenance, monitor regulatory compliance or model distribution analysis, transformer analysis and load analysis.(GulzaraMamazhakypova)**

43. Lease Property and Management: **Revenue can be increased, operations and maintenance cost can be reduced when GIS is used to help manage space. Real estate and property managers can see and make queries about space including its availability, size and special constraints for the most cost effective use.**

44. Development of Public Infrastructure Facilities: **GIS has many uses and advantages in the field of facility management. GIS can be used by facility managers for space management, visualization and planning, emergency and disaster planning and response. It can be used throughout the life cycle of a facility from deciding where to build to space planning. Also it provides facilitate better planning and analysis.(GulzaraMamazhakypova)**

45. GIS for Drainage Problems in Tea Plantation Areas: **Drainage problem in tea plantation differ widely because of its varied nature of physical conditions. Tea crop requires moisture at adequate levels all times of its growth. Any variation either excess or lack has a direct impact on the tea yield. This become greatly influenced the productivity of tea. Required some hydraulic design to solve this problem such as design of drains, checking the adequacy of the river and classification of water logged areas etc. GIS helps to reduce the water logging by establishing well developed plans.**

46. Collection of Information about Geographic Features: **GIS is not simply a computer system used for making maps. A map is simply the most common way of reporting information from a GIS database. So these systems are not only for creating maps but also most importantly the collection of information about the geographic features such as building, roads, pipes, streams, ponds and many more that are located in your community.**

47. GIS for Public Health: **GIS provides the cost effective tool for evaluating interventions and policies potentially affecting health outcomes. GIS analysis, environmental health data is also helpful in explaining disease patterns of relationships with social, institutional, technological and natural environment. It can be understand the complex spatial temporal relationship between environmental pollution and disease, and identifying exposures to environmental hazards. GIS can significantly add value to environmental and public health data.(The application of GIS in environmental health sciences: opportunities and limitations.)**

48. Location Identification: **This technique is used to find a location for a new retail outlet. It helps to find out what exists at a particular location. A location can be described in many ways, using, for instance, name of place, post code, or geographic reference such as longitude or latitude or X/Y.**

49. Knowledge Based System for Defence Purpose: **Regular analysis of terrain is essential for today's fast paced battlefield. Conventional method of studying paper topographical maps is being replaced by use of maps in digital form to get terrain information. It is increasingly being used to derive terrain information from digital images. Which help to the selection of suitable sites for various military uses more accurate and faster. The uses of GIS provide information regarding the terrain features which can be useful for planning today's war strategies.**

50. Pipeline Route Selection: **Pipeline route planning and selection is usually a complex task. GIS technology is faster, better and more efficient in this complex task. Accurate pipeline route selection brings about risk and cost reduction as well as better decision making process. GIS least cost path analysis have been effectively used to determine suitable oil and gas pipeline routes. An optimal route will minimize reduce economic loss and negative socio-environmental impacts.**

51. Producing Mailing Labels for abutter Notification: **Zoning board of appeals hearings or proposed action by a town or city require notifying abutting property owners. A GIS application for producing abutter mailing labels enables you to identify abutting property owners are in different ways. Once the properties are identified this kind of GIS applications can produce mailing labels and be integrated with a word processing "mail merge "capabilities.(http://www.mass.gov/)**

52. Site Suitability for Waste Treatment Plant: **There is an increasing amount of waste due to the over population growth. This has negative impact on the environment. With the help of GIS we can integrate various aspect layers in GIS and can identify which place is suitable for waste treatment plant. This process will reduce the time and it is cost effective. Also it enhances the accuracy. It provides a GIS analyst to identify a list of suitable dumping sites for further investigations. It also provides a digital bank for future monitoring program of the site.**

53. Geologic Mapping: **GIS is an effective tool in geological mapping. It becomes easy for surveyors to create 3D maps of any area with precise and desired scaling. The results provide accurate measurements, which helps in several field where geological map is required. This is cost effective and offers more accurate data, there by easing the scaling process when studying geologic mapping.**

54. Environment: **The GIS is used every day to help protect the environment. The environmental professional uses GIS to produce maps, inventory species, measure environmental impact, or trace pollutants. The environmental applications for GIS are almost endless. It can be used to monitor the environment and analyze changes.(by S FarogMostafa)**

55. Infrastructure Development: **Advancement and availability of technology has set a new mark for professionals in the infrastructure development area. Now more and more professionals are seeking help of these technologically smart and improved information systems like GIS for infrastructure development. Each and every phase of infrastructure life cycle is greatly affected and enhanced by the enrollment of GIS.**

56. Coastal Development and Management: **The coastal zone represents varied and highly productive ecosystem such as mangrove, coral reefs, see grasses and sand dunes. GIS could be generating data required for macro and micro level planning of coastal zone management. GIS could be used in creating baseline inventory of mapping and monitoring coastal resources, selecting sites for brackish water aquaculture, studying coastal land forms.**

57. Crime Analysis: **GIS is a necessary tool for crime mapping in law enforcement agencies worldwide. Crime mapping is a key component of crime analysis. Satellite images can display important information about criminal activities. The efficiency and the speed of the GIS analysis will increase the capabilities of crime fighting.**

58. River Crossing Site Selection for Bridges: **The important geotechnical consideration is the stability of slope leading down to and up from the water crossing. It is advisable to collect historical data on erosion and sedimentation. On the basis of these information asses the amount of river channel contraction, degree of curvature of river bend, nature of bed and bank materials including the flood flow and the flow depth, all these can be done in GIS within estimated time and accurately. This information has been often used for river crossing site selection for bridges.**

59. Land Use Changes Associated with Open Cast Strip Mining: **Mining is the back bone of the developing economy of any country. Mapping, monitoring and controlling the impact caused by the mining activities is necessary so as to understand the character and magnitude of these hazardous events in an area. The data required to understand the impact of mining from the environment is coming from different discipline, which need integration in order to arrive hazard map zonation.**

60. Economic Development: **GIS technology is a valuable tool used for the economic development. It helps in site selection, suitability analysis, and for finding the right sites to locate new business and grow existing ones. Within economic development, GIS is used to support the emerging trend of economic gardening, a new way to foster local and regional economic growth by existing small business in the**

community.(By Ahmed Abukhater,GIS for Planning and Community Development: Solving Global Challenges)

61. School Student Walking Distance Analysis: **If your community buses students to school, but only if they lived beyond a certain distance from their school, this can be used to determine what addresses are eligible for bushing.**

62. Locating Underground Pipes and Cables: **Pipe line and cable location is essential for leak detection. It can be used to understand your water network, conducting repairs and adjustments, locating leaks known distance for correlating etc. Pipelines are continually monitored, check for leak detection and avoid the problem of geo hazards.**

63. Coastal Vegetation Mapping and Conservation: **Coastal vegetation like Mangroves are the protectors of coast from natural hazards like tsunami , so that the conservation of these vegetation are highly important. GIS enable us to map which are having higher density of vegetation and which area need more vegetated? Integration of these details to coastal zone mapping helps to identify the area prone to coastal erosion and we can plant more vegetation to reduce coastal erosion.**

64. Regional Planning: **Every day, planners use Geographic Information System (GIS) technology to research, develop, implement, and monitor the progress of their plans. GIS provides planners, surveyors, and engineers with the tools they need to design and map their neighborhoods and cities. Planners have the technical expertise, political savvy, and fiscal understanding to transform a vision of tomorrow into a strategic action plan for today, and they use GIS to facilitate the decision-making process. (ESRI, GIS Solutions for Urban and Regional Planning)**

65. GIS for Land Administration: **In a number of countries, the separate functions of land administration are being drawn together through the creation of digital cadastral databases, with these database they can reuse land for suitable needs ,digital taxation and even utilities are also easily handle using these database.**

66. Snow Cover Mapping and Runoff Prediction: **Systematic, periodical and precise snow cover mapping supported by GIS technology, and the organization of the results in a snow cover information system forms the basis for a wide range of applications. On the practical side, these applications are related to the monitoring of seasonal and yearly alterations of the snow cover under the presently existing climatic conditions, to simulate and forecast runoff, to map the regional distribution of the water equivalent, and to document the recession process of the snow cover during the melting period in its relation to geological features.**

67. GIS for Wildlife Management: **Man made destruction such as habitat loss, pollution, invasive species introduction, and climate change, are all threats to wildlife health and biodiversity. GIS technology is an effective tool for managing, analyzing, and visualizing wildlife data to target areas where international management practices are needed and to monitor their effectiveness. GIS helps wildlife management professionals examine and envision.**

RGPVNOTES.IN

We hope you find these notes useful.

You can get previous year question papers at https://qp.rgpvnotes.in .

If you have any queries or you want to submit your study notes please write us at rgpvnotes.in@gmail.com

LIKE & FOLLOW US ON FACEBOOK
facebook.com/rgpvnotes.in