UNIT -5
Applications

GIS Applications - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business application - Case Studies.

GIS Applications:

Introduction:

GIS application 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 displays of geographic features.

Mapping Locations:

GIS can be used to map locations. GIS allows the creation of images/maps through automated mapping, data capture and surveying analysis tools.

Mapping quantities:

People map quantities, like where the most and least are, to find places that meet their

criteria and take action, or to see the relationships between places. This gives an additional level of information beyond simply mapping the locations of features.

Mapping densities:

While you can see concentrations by simply mapping the locations of features, in areas with many features it may be difficult to see which areas have a higher concentration than others. A density map lets you measure the number of features using a uniform areal unit, such as acres or square miles, so you can clearly see the distribution.

Finding distances:

GPS can be used to find out what's occurring within a set distance of a feature.

Mapping and monitoring change:

GIS can be used to map the change in an area to anticipate future conditions, decide on a course of action or to evaluate the results of an action or policy.

GIS Applications in Natural Resource Management:

Spatial information is the base for natural resource management. It has been very much essential to know the spatial as well as temporal distribution of the resource if they are to be properly managed in a sustainable manner. Based on the resource base situation, certain management prescriptions can be recommended. The Remote Sensing (RS), Geographic Information System (GIS) and Global Positioning System (GPS) are such technologies that are much more reliable, precise and efficient as well that any other resource assessment technology in resource assessment change detection, suitability analysis, scenario study impact assessment, etc.

Management of natural resources is the need of the hour and therefore commands due importance in the GIS, CAD and software industry as well. The technical specifications of geographic information system and computer aided designing and drafting services assist in management of natural resources.

1) Environmental Management:

The world is developing at an astonishing rate and while this development has aided in improving the quality of life. It has also escalated the unaccounted consumption of natural resources. GIS for environmental management acts as an important management tool that helps in maintaing sustainability of natural resources, environment management. The environmental reforms and policies have grown leaps and bounds from the times of its foundation and therefore the use of modern technologies is inevitable. Modern day technologies like GIS for environmental management can help in understanding the effects on the environment form an inter-disciplinary aspect. This holistic approach is not only benifits the flora and fauna but also benifits mankind by achieving sustainable development using GIS for environmental management.

2) 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 effeciently by the help of GIS, by integrating various GIS layers, assesment of natural features can be performed.

3) Disaster Management:

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 a disaster is identified, preventive measures can be developed.

4) Zoning of landslides hazard:

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 intigrate a variety of spatial data such as geological, structural, surface cover and slope characteristics of an area, which can be used for hazard zonation.

5) Estimation of flood damage:

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.

6) Management of Natural Resources:

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,

ii) Forest cover reduces the storm water runoff and tree canopy stores approximately 25000 tons carbon, GIS is also used in afforestation.

7) 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.

8) 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.

GIS and Engineering:

An advanced information system like GIS plays a vital role and serves as a complete platform in every phase of infrastructure life cycle. Advancement and availability of technology has set new marks for the professionals in the infrastructure development areas. Now more and more professionals are seeking help of these technologically smart and improved information system like GIS for infrastructure development. Each and every phase of infrastructure life-cycle is greatly affected and enhanced by the enrolment of GIS.

1) Planning:

In planning its major contribution is to give us with an organized set of data which

can help professionals to combat complex scenarios relating to the section of site, environmental impact, study of ecosystem, managing risk regarding the use of natural resources, sustainability issues, managing traffic congestion, routing of roads and pipelines etc.

2. Data Collection:

Precise and accurate data is the core driving factor of any successful project. GIS is equiped with almost all those tools and functions that enables user to have access to the required data within a reasonable time.

3) Analysis:

Analysis is one of the major and most influential phases of infrastructure life cycle. Analysis guides us about the validity or correctness of design or we can say that analysis is a method which supports our design. Some of the analyses that can be performed by GIS are

* Water distribution analysis

* Traffic management analysis

* Soil Analysis

* Site feasibility analysis.

4) Construction:

It is the stage when all layout plans and paper work design come into existence in the real world. The CIS helps the professionals to understand the site conditions that affect the schedule baseline and cost baseline. To keep the construction within budget and schedule CIS guides us about how to utilize our resources on site efficiency by

* Timely usage of construction equipment
* Working hours
* effects of seasonal fluctuations
* Optimizing routes for dumpers and concrete works.

5) Operations:

Operations are controlled by modeling of site data and compared by the baselines prepared in planning phase. Modeling of site may be in the form of raster images or CAD drawings. These can help us to keep track of timely operations of activities.

CIS can help to make a record of work that has been completed and can give us

visualization in the form of thematic maps which guide us about rate of operations, completed operations and pending operations.

6. <u>Soil and foundation</u>:

GIS helps in generating soil maps and geology maps of the area that needs to be investigated. This will greatly help in finilizing the type of depth of foundation, load bearing capacity of the soils etc. Though the complete finalisation is not possible without in-situ lab seats of the soil, GIS is definitely an aid in this respect.

7. <u>Structural Engineering</u>:

For designing, modelling, scheduling work flow and for maintenance of building. GIS geo-databases can be created which will be immensely useful and saves lot of time. Oh and GIS can be intigrated with CAD too.

8) <u>Construction Management</u>:

Along with infrastructure management, GIS can be employed to calculate to costs, do site suitability analysis which will save lot of time.

9) Transportation Engineering:

Specifically, traffic engineering is boosted with the help of GIS. Once the database is created and network analysis too is performed, it becomes immensely useful to predict the traffic conditions, finalise the optimum route, locate nearest police stations, hospitals, find alternate routes, you name it, all can be done using GIS.

Navigation:

Navigation mapping assists the navigation content providers using GIS, GPS and Remote sensing technologies instead of traditional method of manual assimilation of data for generation of navigation content. The accuracy of the new technology ensures creation of flawless maps. The rampient increase in the number of people who use computerised navigational services for everyday use. This trend has led to the development of new and innovative geodata content services and products.

It offers mapping of

* Street and road network
* Point of interest
* 2D Landmarks
* 2D foot prints
* 3D City models
* Indoor Building maps
* Street Digitization

The maps are created while playing attention to details such as grid alignment, capturing dimensions accuratly, positional accuracy and completness of content. The data can be provided on multiple platforms.

It uses high end software such as Arc-CIS, ERDAS Imagine / ER Mapper, MapInfo and AutoCAD Map to generate the final product in varied formats according to the projects' requirements.

Direction - Finding:

The use of CIS in navigation industry has been growing at a steady rate. These days the

navigation industry uses new technologies such as GIS, GPS, Remote sensing instead of traditional method of manual assimilation of data for generation of navigation content. The GIS services assist the navigation industry in creating flawless maps.

This steep rise in the use of GIS can be credited to the rampant increase in the number of people who use computerised navigational services for everyday use. This trend has led to the development of new and innovative geo-data content services and products. IT offers high quality and cost effective navigational map data services.

IT services include mapping of

* Road and street network data creation

* Point of interest data creation

* 3D Building Landmark creation

* 2D Building footprints digitization

* 3D City model creation

* Indoor Building Maps creation

* Street digitization.

IT creates the maps while playing attention to details such as grid alignment, capturing dimensions accurately, positional accuracy and completeness of content. The data can be provided in multiple platforms. IT has extensive experience across multiple technologies, platforms for product development and sustenance engineering.

Vehicle Tracking and Fleet Management:

Vehicle security is a primary concern for all vehicle owners. Owners as well as researchers are always on the lookout for new and improved security systems for their vehicles. One has to be thankful for the upcoming technologies, like GPS Systems, which enables the owner to closely monitor and track his vehicle in real-time and also check the history of vehicles movements.

This new technology, popularly called vehicle Tracking Systems has done wonders in maintaining the security of the vehicle.

Vehicle tracking system is one of the biggest

5.8

technological advancements to track the activities of the vehicle. The security system uses Global Positioning System to find the location of the monitored or tracked vehicle and then uses satellite or radio systems to send to the coordinates and the location data to the monitoring center. At monitoring center various softwares are used to plot the vehicle on a map. In this way the vehicle owners are able to track their vehicle on a real-time basis. Due to real-time tracking facility; vehicle tracking systems are becoming increasingly popular among owners of expensive vehicles.

The vehicle tracking hardware is fitted onto the vehicle. It is fitted in such a manner that it is not visible to anyone who is outside the vehicle. Thus it operates as a covert unit which continously sends the location data to the monitoring unit.

When the vehicle is stolen, the location data

sent by tracking unit can be used to find the location and coordinates can be sent to police for further action. Some vehicle Tracking System can even delict unauthorized movements of the vehicle and then alert the owner. This gives an edge over other pieces of technology for the same purpose.

Monitoring center Software helps the vehicle owner with a view of location at which the vehicle stands. Browsing is easy and the owners can make use of any browser and connect to the monitoring center software, to find and track his vehicle. This in turn saves a lot of effort to find the vehicles position by replacing the manual call to the driver.

As we have seen the vehicle tracking systems is an existing piece of technology for vehicle security. It enables the owner to virtually keep an eye on his vehicle any time and from anywhere in the world.

Marketing and Business Management:

GIS provides more in-depth analysis, assessment and understanding of your marketing and promotions. Visualize where your customers are located by analyzing demographic, psychographic, purchasing, and spending characteristics for accurate customer segmentation and helping you find more like them. Use market potential to your advantage so you can optimize your store network and maximize sales from every outlet by improving marketing outreach, campaign performance, and brand interaction. Location analytics is a key element to the successful development, evolution and growth of all aspects of marketing from social media to display advertising, coupon optimization and sentiment analysis.

Success Stories:

These stories show how business organisations are gaining benifits using GIS technology and spatial analysis.

* Nike learns who its customers are

* Location - based choices drive growth at Starbucks
* Carrefour group - better business Analytics by understanding location.

Applications of GIS in Business:

GIS like many other industries, has found its way in business as well. There are various aspects of the business and corporate world wide where GIS has found meaning. Below are some of the applications of this very interesting invention in the field of business.

Banking:

Being market driven banks need to provide customer centric, services around planning of resources and marketing. GIS plays an important role providing planning, organizing and decision making.

Assets management:

GIS helps organisations to locate and store information about their assets. Operations and maintinance staff can also deploy their enterprise and mobile workforce.

Dairy Industry:

Geographic Information Systems are used in the distribution of products, production rate, location of shops and their selling rate. These can also be monitored by using a GIS system.

Tourism:

Tourists can get all the information they need on a click, measuring distance, finding hotels, restaurants and even navigate to their respective links. This information plays a vital role to tourists in planning their travel from one place to another.

Business:

GIS is used for managing business information based on its location. GIS can keep track of where customers are located, site business, target marketing, and optimize sales terrorists and model retail spending patterns.

Market Share:

Examining branch locations, competitor locations and demographic characteristics to identify areas worthy of expansion or determine market share in Maptitude.

ATM Machine:

Filling in market and service gaps by understanding where customers, facilities and competitors are with address locating, database management and query tools.

World Bank Economic Statistics:

Slicing and dicing raw financial data from the world bank.

Merger and Acquisition:

Profiling and finding opportunities to gain and build where customers are with market profiling.

Supply and Demand:

Identifying under-served areas and analyzing your competitor's market.

Mobile Banking:

Capturing locations where existing mobile transaction occur and assisting in mobile security infrastructure.

Internet of Things:

Improving efficiency, accuracy and economic benifit through a network of physical objects, such as devices, vehicles, buildings and other items

embedded with electronics, software, sensors and network connectivity that enables these objects to collect and exchange information with one another.

Market Share Analysis:

Optimizing the locations of facilities so the allocated demand is maximized in the presence of competitors using tools like location-allocation in ArcGIS.

Case Studies:

Network Intelligence Portal:

The Network Intelligence portal is a secure cloud-based information service that brings together asset condition and other survey data from across the network in real-time. It gathers data directly from CCTV, ultrasonic and acoustic survey equipment. Using award winning mapping tools, it delivers network insight to be right user at the right time. Provided by SCISYS in close collaboration with Balflour Beatly and JDT this novel services enables Asset managers to

* Direct and supervise remote 'no-dig' survey

operations using live site data.

* Make informed capital and operational expenditure decisions.

* Develop LEAN and sustainable operations that drive improved operational efficiency, reduce carbon emissions and water footprint and lower Health and Safety risk exposure for the workforce.

* Provide assurance that "as built" asset data is held securely, ensuring the availability when needed and its integrity for future re-use.

* Improve client satisfaction by reducing the time taken to resolve issues.

* Reduce SIM impact by using a pro-active investigation and data capture, storage and streaming service, avoiding dry holes and conservative customer distruptive fixes.

Key Services Features:

Trusted Supplier:

Asset condition data is captured on-site using state-of-the art surveying technology supplied by JD7 and operated by trained staff.

Remote Oversight:

Data is available on the desktop in real time, subject to a suitable network connection in the field, enabling decision makers to manage their time more effectively.

Intuitive User Interface:

The map-based interface makes the data accessible and easy to understand. Analysis tools allow the full detail of the data to be scrutinised, enabling decisions based on the best possible network condition information.

Data Security:

Video and pipe-wall condition data is held securely to prevent unauthorised access, ensuring data quality and the audit trail are maintained. Only authorised users can view the data, accessing the system using a secure user name and password.

High Availability:

Private cloud hosting ensures data is available when required. Data is backed up to a seperate

...age location to ensure business continuity in the unlikely event of data loss on the live service.

Extensible Service:

The service is designed to allow new data sources to be incorporated as and when they are required, such as on the introduction of new network inspection technologies.

Benifits of Utility Companies:

An increasing number of pipe condition assessment and camera systems provide asset management information in a variety of formats. The SCISYS Network Intelligence Portal will combine all of the data to provide a comprehensive view of this information, enabling focused and astute solution design and delivery.

Diginight:

Diginight is a solution form SCISYS that allows users to quickly and efficiently capture and edit real world features through their web browser. Diginight can be deployed on

5.13.

premise or provided as a fully managed cloud service, including the provision of base mapping from Ordnance Survey or other mapping providers.

Digiright has integrated security and is scalable. It will integrate with mainstream Geographic Information data feeds as well as customer's own spatial data.