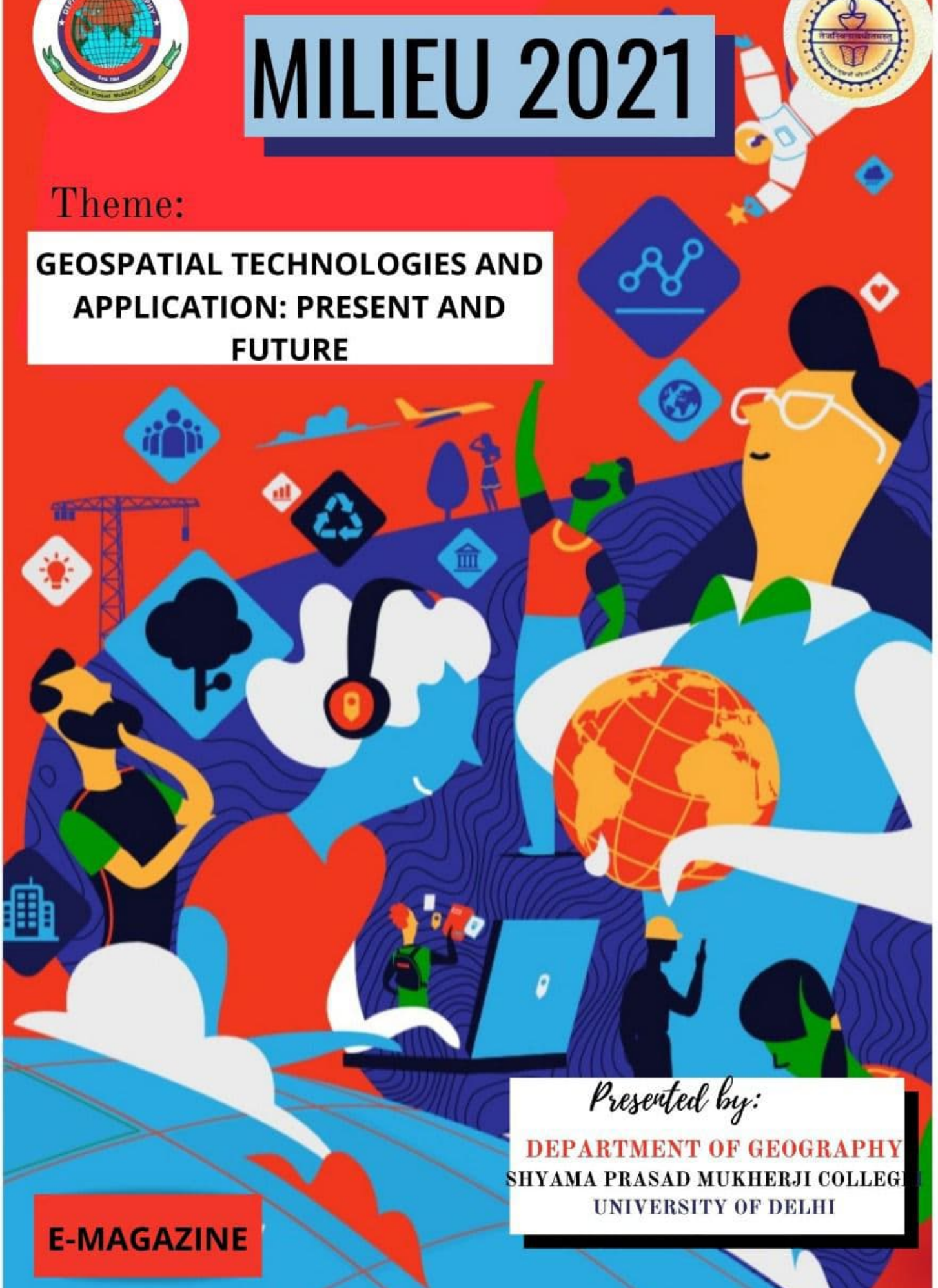
MILIEU 2021

Theme:

GEOSPATIAL TECHNOLOGIES AND APPLICATION: PRESENT AND FUTURE



Presented by:

DEPARTMENT OF GEOGRAPHY
SHYAMA PRASAD MUKHERJI COLLEGE
UNIVERSITY OF DELHI

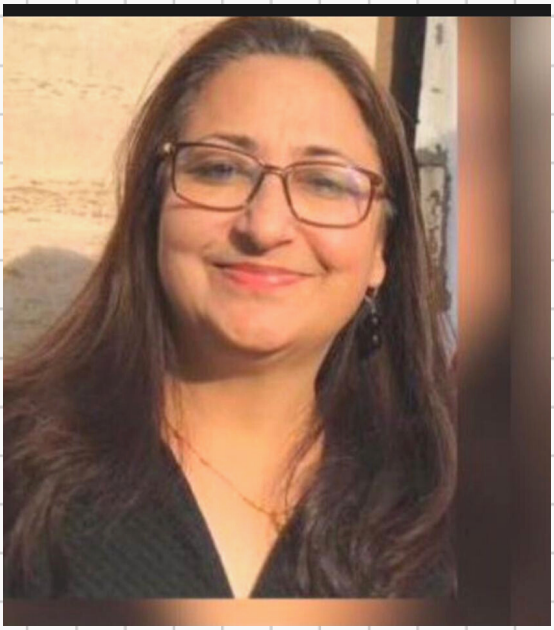
E-MAGAZINE

From the Principal's Desk

With great pleasure I want to say that E-magazine of Geography department is making great contributions by creating the awareness about new concepts and tools in the field of Geography. In the present edition of the magazine the discussion is on Geospatial Technology, which is a term used to describe the range of modern tools contributing to the Geographic mapping and analysis of the Earth and human societies. It's an emerging field of study that includes Geographic Information Systems (GIS), Remote Sensing (RS) and Global Positioning Systems (GPS) . I appreciate the efforts of editorial team for choosing such relevant and important topic,s which impart the knowledge to those ,who do not specialise in the subject. My best wishes to the Geography department for the great contribution in future also. All the best.

Prof. Sadhna Sharma
Principal officiating

FROM THE TEACHER - IN - CHARGE'S DESK



Scientists are still debating the exact cause of the flash floods that devastated Chamoli district of Uttarakhand on Feb the 7th. We have just concluded a very successful '3 days training workshop' in collaboration with the NIDM on "Geo Spatial Technology , Inclusive and accessible Disaster Risk Reduction".

Maps: They've been around longer than photographs. They've defined empires, guided explorers, told stories, and captured the imagination of many a hopeful traveller for years. Maps are embedded in the smart phones we carry; they're installed on the dashboards of our cars and we never seem to be lost. Maps, and the powerful geospatial technologies that populate them with data are also playing a bigger role in our lives. The Geospatial Revolution examines the world of digital mapping and how it is changing the way we think, behave, and interact.

It gives me immense joy and pride to inaugurate the fourth issue of the annual e- magazine "Milieu" of the dept of Geography, SPM college. The theme of our magazine: " Geo-spatial technologies and application – present and future" is very relevant and in alliance with the need of the hour. We are releasing this magazine at a very crucial stage of humanity where on one hand we are struggling with the fatal pandemic and just two months back our country witnessed one of the worst disasters in the history.

Geospatial technology enables us to acquire data that is referenced to the earth and use it for analysis, modelling, simulations and visualization. It allows us to make informed decisions based on the importance and priority of resources most of which are limited in nature. It has become an essential part of everyday life. Especially in the last decade, these technologies have evolved into a network of national security, scientific, and commercially operated satellites complemented by powerful desktop GIS. In addition, aerial remote sensing platforms, including unmanned aerial vehicles are seeing increased non-military use as well.

And my dear students a major change in the country's mapping policy has been announced by our Prime minister. You must grab this opportunity and ignite your young minds to develop new ideas to help the community. The move is said to release a lot of data that is currently restricted and not available for free. This path breaking initiative has come at a time when advances in mapping technology can play a key role in many walks of life . Liberalisation of the mapping industry and democratization of existing datasets will spur domestic innovation and enable Indian companies to compete in the global mapping ecosystem by leveraging modern geospatial technologies.

As a small initiative, we at SPM try to inculcate good practices in our students for their better future. Tapping the vast potential of our students through such a magazine is one such endeavour in this direction. I am confident that this student activity with contents envisioned and written by students themselves will provide an insider view on everything ranging from creativity of the students to events and profiles. This has been possible by the continuous support and guidance of our college principal, hard work put by the faculty and passion and zeal of our young and bright girls.

I congratulate the entire editorial team and contributors and enthusiastically look forward to reading our student's perspective on the theme undertaken.

Best of Luck !!

Dr. Rachna Dua

Teacher- In - charge

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Message from Faculty Advisor and Editor

The ongoing pandemic has made us more technology savvy. As a basic user of this amazing tool, we have become adept in using it for multifarious activities which ranges from navigation, to online shopping, to making digital payments, to tracking covid hotspots, to online teaching and learning etc. Governments and private organizations are using it for mapping, planning, monitoring, restructuring, reorganization of available resources. In the past year we have used it like never before. As challenges are increasing everyday application of Geospatial technology is becoming more and more critical.

We have learnt its meaning, its components, its evolution and its growing applicability. Armed with all this learning we thought of doing our 4th edition of E-Magazine on the theme, Geospatial Technologies & Applications: Present & Future. This edition showcases students understanding of the topic and their creativity. I hope you would find the magazine interesting and enjoy reading it.

In the end I would like to express my gratitude to our Principal Dr. Sadhna Sharma for her continuous support and encouragement in all our endeavours and our Teacher- in- charge Dr. Rachna Dua for her continuous guidance.

I would like to thank all the authors/ contributors for their contribution and the editorial team who have worked very hard to make this magazine.

Thank you

Ms. Anuradha Shankar

Message from Faculty Advisor and Editor

Dear Readers,

We have been bringing MILIEU since 2017, this is our 4th edition and in each edition, we have tried to focus on different relevant themes. In this edition, our focus is on Geospatial Technology and its application in the present and future times. The main motive behind bringing out this edition is to apprise everyone with the growing importance of geospatial technologies.

The application of geospatial technology is no longer limited to mapping or traffic navigation but in many activities, geospatial technologies are being applied today. Geospatial Information integration is required in varied industries including healthcare, telecom, agricultural, geology, civil construction,0 urban and regional planning, environmental modeling etc. Even the current pandemic situation has shown us how geospatial technology helped in both responding and containing the crisis situation through mapping, tracking and creating social awareness.

Today, both private and public organizations are fastly realizing the importance of geospatial technology and its future prospect. The demand for geospatial technologies has increased manifold giving a higher scope of career opportunities to professionals equipped with geospatial technical expertise.

In this edition of MILIEU each article, poem and poster bring forth the varied application of geospatial technology making this an interesting read for everyone.

In the end, I would like to thank each author/contributor and the editorial team for their hard work in bringing out this edition.

Thank You
Dr. Gargi Kar Majumdar

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EDITORIAL NOTES

"Genius is in the idea. Impact, however, comes from action - Simon Sinek"

If the past year and half of the pandemic was any proof: We have been firsthand witnesses to a time that has brought with it- Change, adaptation, and a flurry of technological advancement. With changing times, our needs are diversifying. The world is picking pace and as curious citizens, we have to keep up. There could not have been a better time to focus on 'Geospatial technologies and their applications' simply because its need and stipulation in the present and the coming future is multitudinous and boundless. It is the sheer transcendence of the human race that people today have reached the height of maximum easement and advancement. The evolution and changing dynamics of emerging technologies are playing a vital role in addressing and solving quests across various fields. And geospatial technology systems are one of the most prominent pillars of these emerging technologies. Over the years, geospatial technology has revolutionized our world and daily lives. With the creation of amazing tools and resources putting useful information at our fingertips, it has paved the way into our lives and made them easier, faster, better, and more gratifying.

Its application ventures into industrial setups, health care facilities, educational institutions, banking systems, ticket booking counters, carrying out business proceedings, governmental jobs in fact in all aspects. Greater accuracy, more potential, and diversity of application make people more and more intrigued towards it. There is no denying that the future of Geospatial technology will continue to revolutionize our lives. It is sure to transform our lives in unbelievable ways and our primary attempts through this magazine are to highlight the many ways Geospatial technology is changing our lives and will continue to.

"An investment in knowledge pays the best interest" – Benjamin Franklin

With that visionary thought in mind, We present to you, the fourth edition of our annual online magazine 'MILIEU-2021'. It is the culmination of sincere efforts and industrious flair from everyone that has contributed to the success of the magazine. Our profound gratitude extends to all those who contributed to the magazine with their valuable and insightful submissions.

We hope our combined efforts make this magazine worth your while and add to your intellect.

Happy reading!

Eureka

EDITORIAL NOTES

" Tomorrow belongs to those who prepare for it today. — Malcolm X"

Welcome to the 4th edition of "MILIEU" the annual magazine of DEPARTMENT OF GEOGRAPHY. We are really proud and exuberant to acclaim that we are ready with all new hopes and hues as we bring out- "MILIEU 2021".

A lot of things happened in 2020: an "unknown enemy" attacked us unannounced, took away millions of lives and livelihoods, disrupted supply chains, and pushed the global economy into deep recession. The pandemic also exposed some fundamental problems plaguing our global village, such as unsustainable development and a digital divide. It was an unprecedented situation and it called for an extraordinary response. While governments, law enforcers and healthcare professionals put their best foot forward, they also required assistance with data and technology. As always, the geospatial industry rose to the occasion and played a key role in mitigating the crisis. From infrastructure building and strengthening supply chains, to keeping people safe, geospatial data and technologies were used extensively in all covid response efforts. Hence the theme of our magazine is "GEOSPATIAL TECHNOLOGY".

The enthusiastic write ups of our young writers are indubitably sufficient to hold the interest and admiration of the readers. This herculean task of editing this annual magazine would not have been possible without the sincere support of the members of the Editorial Board who sorted of the articles from the flood of articles we had got from our enthusiastic and inquisitive writers, edited them and finally made a fair draft of them. We ate really thankful to our respected Principal for entrusting us with the responsibility of editing. We would like to extend my sincere thanks to Ms. Anuradha Shankar and Ms. Gargi Kar Mazumdar ma'am for their constant guidance and support throughout the process of planning and publication of this magazine.

We warmly wish all the readers my best wishes.

Unnati

EDITORIAL NOTES

"The mind is not a vessel to be filled but a fire to be ignited. – Plutarch"

It gives us great pleasure and pride to present the 4th edition of our annual magazine "MILIEU". In this fast changing world, our department and students need a platform to show their work, research, and achievements, and MILIEU is a great way to know about our institute, its success as well as various events and competition organized by it.

In today's world pandemic, climate change, unemployment, crime, disaster management, land use management, and mission mars are the topics that always remain in the headlines. And these topics are giving rise to a new field of study which is known as Geospatial Technology a field that is a digital trail which has located every point on the earth's surface. Geospatial Technological advancements like the miniaturization of sensors, high-speed data transfer, and enhanced storage capabilities have led to a new wave of satellites specially built for monitoring pollution and tracking the sources of emissions. Which has enabled us to gain actual insight, into the nature of pollution and formulate strategies to tackle it. During the pandemic of Covid-19 Geospatial Technology map the outbreak, the spread of Covid-19 which become a medium to communicate the situation on the ground. Even some application of Geospatial Technology helps us to design land use/land cover mapping, cropland mapping, soil erosion assessment. So we can see that there are numerous work in Geospatial Technology which is opening the gate for employment in this field.

Lastly, I would like to extend my thanks to all my teachers, batchmates, and team member for their contribution to the magazine and for fulfilling all aspects to give us a great insight about the use of geospatial technology, its contribution and importance in today's world.

Jyoti

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Fun Facts and Do You Know By Anjali

OPEN DATA SOURCES FOR REMOTE SENSING APPLICATIONS

BY: AAKASH UPADHYAY
Assistant Professor, Department of Geography, SPM College, University of Delhi

With increasing applications of this ever growing technology, the need of the hour is to provide access to varied databases to the users which will go a long way in our future endeavours. The following Data Sets have been compiled from various internet sources to give you an insight into kind of data available for free for you to explore and work on.

REMOTE SENSING - GIS DATA AND OPEN-SOURCE SOFTWARES

- ·**Bhuvan** - http://bhuvan-noeda.nrsc.gov.in/data/download/index.php?
- ·**NASA Earth Explorer** – Remote Sensing and DEM datasets - https://earthexplorer.usgs.gov/
- ·**Alaska Satellite Facility** - https://vertex.daac.asf.alaska.edu/
- ·**Sentinel Satellite Data** – Search & Download - https://vertex.daac.asf.alaska.edu/
- ·**Land Viewer** – Automated Satellite Image Processing & Downloading https://eos.com/landviewer/?lat=24.20026&lng=-97.75635&z=4
- ·**Land Viewer – For Automated NDVI, Snow Cover Extraction**
- ·**GEE-Google Earth Engine**
- ·**GRASS- Geographic Resource Analysis Support System**
- ·**Q GIS**- Quantum GIS
- ·Map Window GIS
- ·**ILWIS**- Integrated Land and Water Information System
- ·**UNEP Global Geo-Spatial Datasets** - http://geodata.grid.unep.ch/
- ·**ESRI Global Spatial Open Datasets** - https://hub.arcgis.com/pages/open-data
- ·**Free GIS Dataset Global** - https://freegisdata.rtwilson.com/
- **USGS** - https://water.usgs.gov/software/lists/alphabetical

METEOROLOGICAL DATA

- ·**India WRIS** - Groundwater Level Data, Rainfall, Soil Moisture, Reservoir Data
- ·**SM2RAIN Data Sets** - http://hydrology.irpi.cnr.it/download-area/sm2rain-data-sets/
- ·**NASA** – AgMIP Climate Forcing Data Sets
- ·**NOAA** – National Oceanic and Atmospheric Administration – For Global Historical Climate Network Daily
- ·**Future Water** - https://www.futurewater.eu/
- ·**SWAT** – Soil and Water Assessment Tools - https://swat.tamu.edu/
- ·**SWAT India Data Sets** - https://swat.tamu.edu/software/india-dataset/
- ·**CMIP5 GCMs & Other Models Data Download** - http://climexp.knmi.nl/selectfield_cmip5.cgi?id=someone@somewhere
- ·**World Climate Research Program** - https://esgf-node.llnl.gov/search/cmip6/
- ·**Global Discharge Data** - https://floodobservatory.colorado.edu/DischargeAccess.htmlhttps://floodobservatory.colorado.edu/SiteDisplays/Summary5.htm

ROLE OF GEOSPATIAL TECHNIQUES IN WETLAND MANAGEMENT

BY: MAANSI MALIK
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Wetlands are defined as transitional lands between terrestrial and aquatic ecosystems where the water table is at or near the surface or land is covered by shallow water (Mitsch and Gooselink, 2015). There are three integral components of the wetland definition: Hydrology, Physiochemical environment and Biota which reinforce each other and are interconnected. Wetland hydrology, however, is the most important determinant to establish and maintain specific wetland functions and processes. Several services are attributed to wetland hydrology and wetlands have benefitted human beings in several ways since time immemorial. The Ramsar Convention or the Convention on Wetlands is responsible globally for advocating the cause for wetland conservation, protection and management particularly as an important habitat for waterfowl species. However, the treaty has evolved over time and has encompassed within it a much broader aspect of "wise use" of wetlands that is essential for the sustainable development of wetlands.

Wetlands are the most productive ecosystems and have been described as the "kidneys of the landscape" (Mitsch and Gooselink, 1993). They perform several ecological functions of great value to mankind. The economic evaluation of services rendered by wetlands is computed to be around the US $ 4879* 109 per year. Wetlands are unique ecosystems given the rarity of species they host. They inhabit about 45% of the entire biological wealth of all the global ecosystems. Rightly acknowledged as "biological supermarkets" they support extensive food webs and rich biodiversity (Kohli, 2015). They serve as habitats for many endangered species, particularly the waterfowl diversity, the concerns for which triggered the entire movement to enact the Ramsar Convention. Another important concept that is central to the Ramsar Convention as well as the idea of sustainable development is that of "ecosystem services" – which acknowledges the wide-ranging benefits of wetlands to human beings particularly the rural poor. The Millennium Assessment classifies ecosystem services as: - provisioning services: the resources or products provided by wetlands, regulating services: the role of wetlands in maintaining the essential ecological processes and life-support systems, cultural and amenity services: the recreational, aesthetic, spiritual, artistic and historic importance of wetlands and supporting services: the role of wetlands as habitat for flora and fauna.

As an ecosystem, wetlands being a transitional system are much more fragile and vulnerable to degradation. They were initially conceived of as marshes to be drained and with more an more advancement and paucity of land wetlands are significantly threatened to extinction – a term technically referred to as wetland loss i.e. physical loss of wetlands as well as degradation of its functional value. . This loss is reflected morphologically where the areal extent of wetland is reduced significantly due to exogenous influences. In fact, the basic premise of the Ramsar treaty is to prevent the habitat destruction of waterfowl species who are dependent on wetlands and prevent any conflict of interest with the inhabiting human populations. Therefore, the incumbent problem before us is not only wetland loss, degradation and destruction but also the implications in the form of declining species richness, species composition and extinction of species due to habitat destruction.

Wetland Management as a process involves the vast process incorporating identification, monitoring and regulation of wetland services apart from preventing any form of wetland degradation as any functional loss resulting due to wetland degradation is equally unwanted as the physical loss. Conclusively, wetland management looks at both the qualitative and quantitative improvement of wetlands. Different traditional methods like biomonitoring of wetlands to understand primary productivity, analysis of water quality based on several parameters and field observation and surveys of biological wealth of wetlands have been used to monitor the health of wetlands. These methods have mostly confined to laboratories or primary field surveys which are time taking and extremely expensive. Moreover, field surveys cannot be conducted for several wetlands which may be located in isolated higher reaches that are not accessible or may be seasonally accessible.

Today, this limitation has been eradicated with the evolution of geospatial technologies and several methods have devised to assess the health of wetlands by the click of a mouse. Sophisticated softwares and satellite data in high resolution have revolutionised the entire spectrum of available knowledge on wetlands. Not only assessment of wetland health or degradation can be done with the help of remote sensing and GIS but the most important task of identification and mapping of wetlands has become very easy.

The first scientific inventory and assessment in India were conducted by the Space Application Centre, Ahmedabad in 1992-93 which stimulated the extensive use of geospatial techniques for wetland conservation and management. Recently, India updated it's wetland inventory satellite data through the National Wetland Inventory and Assessment Project (2011) based on the classification system adopted under the broad framework of the Ramsar Convention. There are many satellites which have high enough resolution for use in water quality monitoring studies (Nas et al., 2008). Development of water quality models and GIS-based framework for the assessment of eutrophication have successfully overcome the limitation of spatial variability of data and fragmented data collection of sampling surveys (Xu et al., 2001).

Use of spectral indices based on variation in spectral properties of different surface features have become important to monitor wetland extent as well as presence of aquatic vegetation or physical attributes like turbidity. Most commonly used indices include the Normalised Difference Vegetation Index (NDVI), Normalised Difference Water Index (NDWI), Modified Normalised Difference Vegetation Index (MNDWI) and Normalised Difference Snow Index (NDSI) for high altitude wetlands. Digital Elevation Models are being used to identify the catchment of different wetlands which was a tideous task previously. Availability of high-resolution data products has also facilitated land use/cover analysis of wetland and the surrounding areas as well as change detection analysis to add a temporal dimension. Such techniques when used for analysis over a period of 30-40 years, generates significant and impactful insights critical for decision making and land-use planning. Besides, the study of wetlands, GPS technology has enabled the monitoring of several migratory species that visit the wetlands seasonally as availability of diver flora as well as fauna is an important indicator of the health of wetlands.

Although significant achievements have been made with regard to wetland management, things are far from complete. Common challenges like availability of good quality satellite data with respect to timing and resolution exist. Today more than 300 Earth observation satellites are operational but owing to the complex hydrology of wetlands, acquiring accurate images is difficult, yet the advancements that have been made are praise worthy.

APPLICATION OF REMOTE SENSING AND GIS TECHNIQUES IN MONITORING LAND COVER CHANGE

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Introduction

Land cover is the physical material at the surface of the earth. It is the material which directly interacts with electromagnetic radiation and causes the level of reflected energy which observes as the tone or the digital number at a location in an aerial photograph or satellite image. Land cover also varies with the difference in altitudes due to variation in receiving solar radiation by earth surface Land covers include grass, asphalt, trees, bare ground, water etc. The Remote Sensing and GIS techniques are considered one of the best methods for land cover change detection study, as it is capable of providing spatial and temporal information within a small period of time. The main objective of the study is to determine land cover change in Spiti Valley. The study area is located in the North- Eastern part of Himachal Pradesh, India (Figure 1).

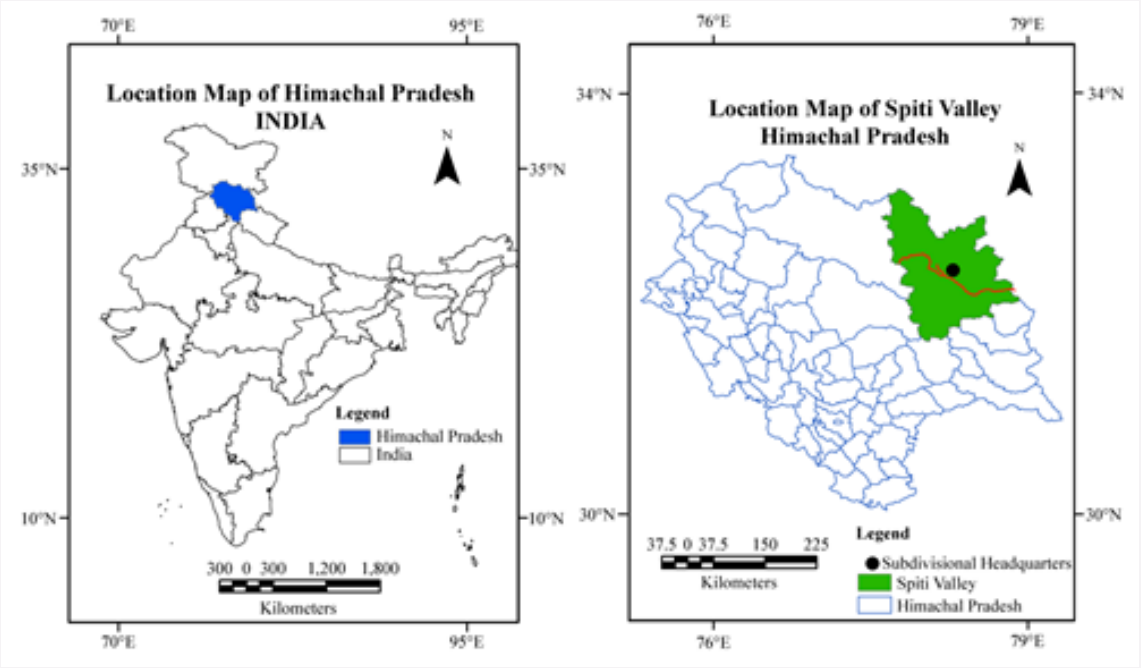

Figure 1: Location Map of Spiti Valley

Data Set and Methodology

Landsat imagery was the main data source for classification and change analysis. Cloud-free Landsat data of the month September was selected for better analysis of land cover change. Landsat imagery data include Landsat Thematic Mapper (TM) and Operational Land Imager (OLI) scenes for the year 1990 and 2015 respectively. These datasets were acquired from the National Aeronautics and Space Administration (NASA) through their USGS (EarthExplorer) Data Gateway Database. The different land cover types of the study area were grouped into four classes for easy analysis and assessment of change detection (Table 1).

Table 1: Description of Land Cover Classes used for Change Study (1990 – 2015)

LULC Types	General Description
Vegetation	Area covered with natural grass, small shrubs, crops and apple orchards.
Snow	Area covered by snow
Barren Land	Area of land got bad either due to erosion or climatic conditions.
Water Body	Area covered with water, stream, river, glacial lake etc.

Source: Categorized by Author

A supervised classification is an essential tool used for extracting quantitative information from remotely sensed image data. Changes in land cover were calculated by using supervised classification technique in Erdas Imagine 2014. The supervised classification was carried out using composition of band 4, 3 and 2 by applying the False Color Composite (FCC) to select the region of interest for features like barren land, vegetation water body, and snow. Around 100 to 150 pixels were taken as samples from all the four attributes during classification of the image.

Result and Discussion

As per the result barren land occupies the largest area amongst the all four land cover types. Snow is the second dominant land cover type in the study area: as high altitude region provides a favorable condition for snow. Vegetation in the area is the third in spatial coverage, generally found along on the bank of rivers and streams which is limited due to tough terrain and harsh climate in the region (Figure 2).

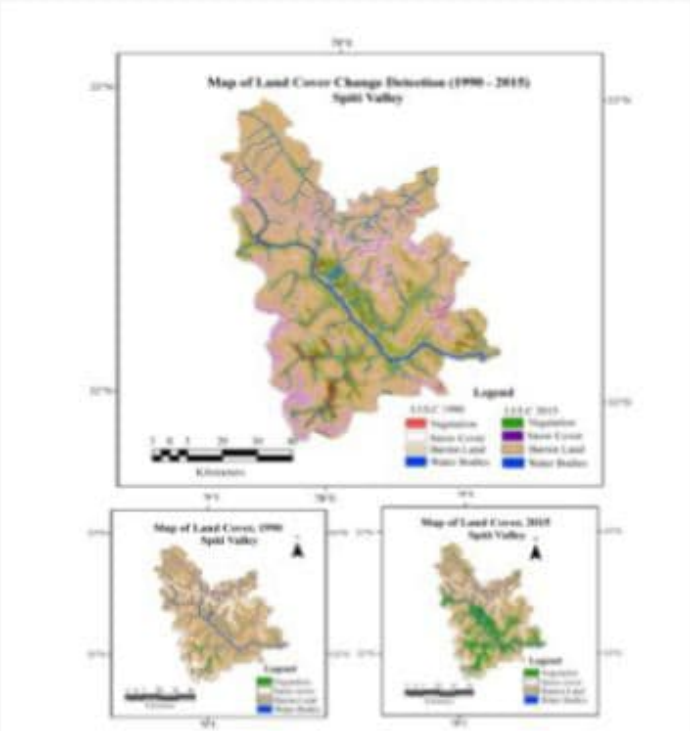

Figure 2: Map of Land Cover Change Detection

The result also shows that vegetation and water bodies increased by 107,569.30 ha (604.15%) and 40.94 ha (0.88%), respectively. Snow and barren land decreased by 19,157.49 ha. (24.09%) and 88,452.75 ha (14.12%) during the study period. A significant increase has been noticed in vegetation amongst all land cover types (Table 2).

Table 2: Land Cover Change Detection (1990 to 2015)

LULC Types	1990		2015		1990 – 2015	
	Area (ha.)	Area (%)	Area (ha.)	Area (%)	Area (ha.)	Area (%)
Barren Land	626108.45	86	537655.70	73.85	- 88,452.75	- 14.12
Vegetation	17805.23	2.44	125374.53	17.22	+ 107570.30	+ 604.15
Snow	79503.79	10.92	60346.30	8.28	- 19157.49	- 24.09
Water Body	4606	0.63	4646.94	0.65	+ 40.94	+ 0.88
Total	728023.47	100	728023.47	100	-	-

Source: Computed by Author from Landsat Imagery

Land cover change analysis by using Matrix

Matrix table was used as a technique to evaluate land cover change between two different years 1990 and 2015. Table 3 shows the summary of land cover change matrix in hectares from 1990 to 2015. The matrix table shows that as a whole, about 2,151,647 ha (30%) area of Spiti valley experienced change in land cover types in the last 25 years. The sum total of the columns shows the area for each land cover types of the initial year 1990 and sum total of the rows shows the area for each land cover types for the year 2015. The values in each cell of matrix table represent the amount of land that has been converted from one land cover type to another.

Table 3: Summary of Land Cover Change Matrix from 1990 to 2015 (ha)

	From / To	1990				
		Vegetation	**Snow**	**Barren Land**	**Water body**	**Total**
2015	Vegetation	**17206.60**	254.25	107896	17.68	125374.53
	Snow	15.12	**43748.70**	16569.70	12.78	60346.30
	Barren Land	571.95	35440.30	**501628**	15.45	537655.70
	Water body	11.56	60.54	14.75	**4560.09**	4646.94
	Total	17805.23	79503.79	626108.45	4606	728023.02

Source: Calculated by Author from Landsat Imagery

For example, the value 60.54 ha, in the second column, (snow) of the fourth row (water body) means that 60.54 ha of snow is now converted into a water body from 1990 to 2015. The highlighted diagonal values represent the area of each class that remains unchanged while the off-diagonal values represent the change in area. For example, out of 17,805.23 ha of vegetation in 1990, around 17,206.60 ha (96.62 %) remains unchanged during the study period, implying that about 3.36% of the vegetation converted to other land cover types. Out of 3.36% of vegetation cover 15.12 ha (0.085%), 576 ha (3.22%) and 11.56 ha (0.06 %) converted into the snow, barren land, and water body respectively. During the same period, out of 79,503.79 ha of snow cover, around 43,748.70 ha (55%) remains unchanged while remaining 45% of snow cover of 1990 converted to other land cover types. For instance, of 125,374.53 ha total cover of vegetation in 2015; about 254 ha (0.32%) converted from the area, which was the part of snow

cover in 1990 and 35,440.3 ha (44.63%) changed into the barren land. Around 60 ha (0.07%) of the total snow cover converted into the water body in 2015. The original extent of barren land (about 626,108.45 ha) reduced by 14.12 % due to change into other land cover types and around 4514.09 ha. (79.75%) remained unchanged during the study period. Out of 6,226,108.45 ha of barren land, 107,896 ha (17.23%), 16,569.70 ha (2.64%) and 14.75 ha (0.002%) converted into vegetation, snow and water body, respectively. Similarly, 4560 ha (99%) area of water body remains unchanged during the study period and original extent of water body (4560 ha) reduced by 1%. Thus, 1% area of water body converted into other land cover types where around 17.68 ha (0.38%), 12.78 ha (0.28%) and 15.45 ha (0.33%) converted into vegetation, snow, and barren land respectively.

CONCLUSION

Spiti valley saw significant changes in land cover types over the past 25 years, where it was observed that vegetation cover increased at the expense of barren land and snow cover. This has been examined by supervised classification technique with the help of remotely sensed data (Landsat) of 1990 and 2015. A continuous increase has been observed in vegetation cover at the expense of barren land and snow cover. In addition, increases in vegetation cover along the bank of river illustrate the rapid commercialization of agricultural and horticultural products, better infrastructure and transportation facilities and change in climatic conditions etc. The change matrix detection of 25 years revealed that about 30% area of Spiti valley has experienced change in land cover. The result will help in monitoring dynamics of land cover change in future, which is very essential to study livelihood security of the people living in the valley, where local people are totally dependent on primary activities.

ROLE OF GEOSPATIAL TECHNOLOGIES IN DEVELOPING RENEWABLE ENERGY SOURCES

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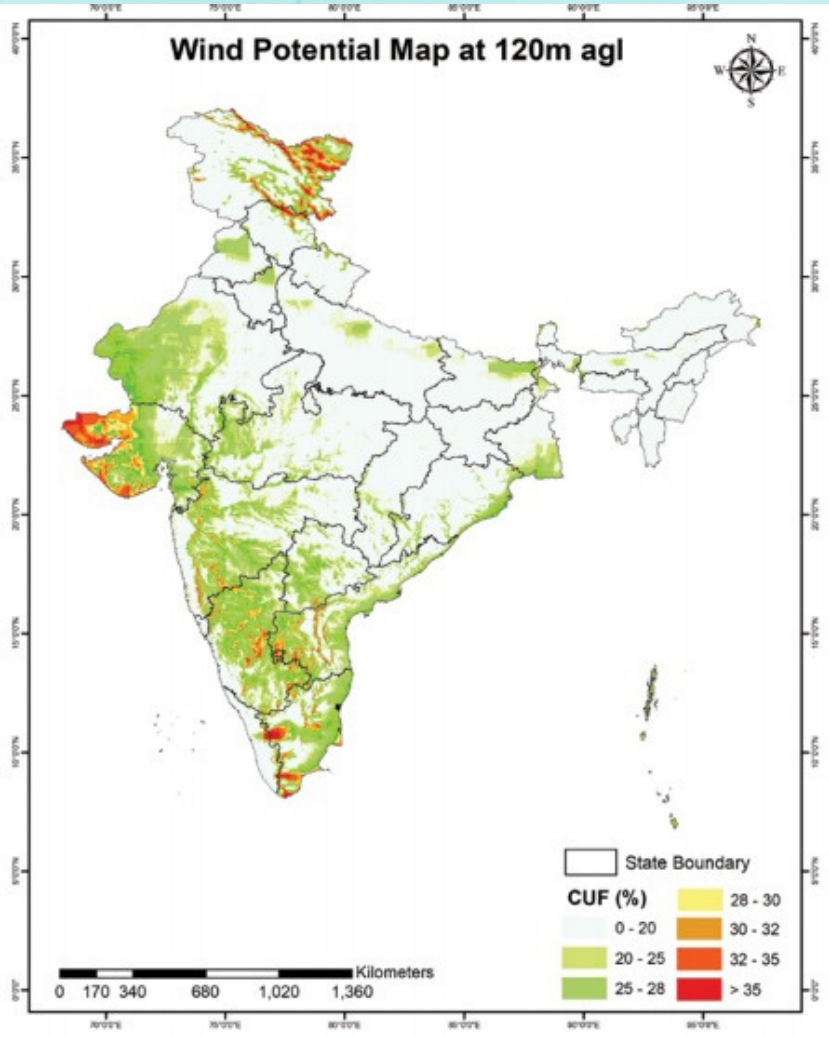
Energy is considered as one of the important inputs for economic growth and human development worldwide. Unprecedented urban expansion and the rapid pace of developmental aspects are thus facing an energy crunch that needs to be fulfilled by traditional or alternative resources. The sustainability of future energy systems is critical for sustainable development. Renewable energy is a key element for sustainable energy solutions. One of the first steps for the exploitation of any energy source is its estimation and mapping to identify the most suitable areas in terms of energy potential. Given the environmental impacts of fossil fuel production and use, increasing reliance on foreign energy supplies, and the depletion of easily accessible

fossil and fissile energy resources, there is a practical incentive to actively govern a transition to renewable energy (RE) resources including wind, solar, water, biomass, and geothermal. To understand the current trend of renewable energy, it is important to analyze the spatial variation of resources and their deployment. A Geographical Information System (GIS) with other integrated components highlights locational and attribute data of spatial related features. Renewable energy sources are site-specific in nature thus in order to locate the areas of optimum generation remote sensing and GIS techniques are of immense use. When it comes to the Indian scenario the vast landmass and diverse topography of the mainland offer immense conventional and non-conventional energy generation potential in form of the fast flowing rivers emerging from the Himalayas. Extended coastlines along with western Thar deserts equally are capable of generating renewable energy in voluminous quantity. India has set ambitious renewable energy (RE) targets of 100,000 MW of solar power, 60,000 MW of wind power, 10,000 MW of energy from biomass and 5,000 MW from small hydroelectric projects (175 GW of total renewables) by 2022 with current clean energy capacity of 33,000 MW. Renewable Energy has become one of the most important factors and hope for the world to preserve the pristine environment and the planet's resources for future generations. India has been leading the world on this front showing the developing nations of the world a way forward for socio-economic growth without degradation of the environment. In India, renewable energy has started playing an increasingly important role in the augmentation of grid power, providing energy access, reducing the consumption of fossil fuels, and helping India pursue its low carbon development path. Renewable energy options are plenty but the performance of these resources relies on location-based variables thus deploying the geospatial tech. and further analysis may reduce the resistance being face by this energy segment. Geospatial technology is therefore proving to be an essential component of the decision making process in renewable energy establishments. Recent researches have resulted fruitful as computation of insolation including the temporal and spatial variation of albedo and solar photovoltaic yield can be further utilized for energy generation with help of different geospatial techniques. Wind energy potential estimation along with India's coastline which is approx. 7500 km is also in pipeline using GIS technology.

Renewable energy setup at (a) Kargil, Ladakh and
(b) Sambhar, Rajasthan Source: MNRE, Annual Report (2019-2020)



Source: MNRE, 2019

Geospatial technologies are equally helpful in environmental management and monitoring of renewable energy sources in harsh and fragile environments. Like the techniques suggest, possible measures so that the detailed guidelines for installation are followed in the best possible way. According to hydropower specialists, the development of this source in a terrain requires a thorough study of Geology, Topography, Land use patterns, distribution patterns of Biodiversity resources, Infrastructure, Socio-Economic activities, and so on. Due to altitudinal variation, 2D mapping may not be enough to understand the topographic characteristics of terrains. Hence, one should always prefer 3D visualization and use a digital elevation model (DEM). The DEM helps to calculate slope gradient. Using DEM, one can develop differently models and simulations to understand various scenarios after constructing a dam in the river channel. Buffer zonation can be also taken into consideration to demarcate the overlapping areas within consecutive hydro project boundaries. Thus installation of such power projects need a proper site selection criteria otherwise, may result in ecological degradation in fragile mountain ecosystem. It has been noticed that there is widespread mushrooming of the hydropower industry in the Himalayan region. The technology helps in the accurate calculation of water discharge, drainage density, and drainage length. A GIS-based drainage database system provides a holistic scenario of a river system, which is not possible even when conducting detailed field survey. The distribution of renewable resources, land availability, site suitability, the absorptive capacity of proximal infrastructure, and local socio-political acceptance are some other equirements that lead to the sustainable development of alternative energy resources. The mentioned parameters can be easily managed by incorporation of geo spatial technologies.

GEOGRAPHY AND GEOSPATIAL TECHNOLOGY

PREM PRAKASH
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At the forefront of the digital information revolution in geography is the geographic information system (GIS). The advent of GIS technology has made it possible to efficiently integrate, manage, and analyse geographical information from maps, imagery, and text. The geospatial techniques that contain a high-resolution database is a powerful tool for solving spatial problems. The impact of GIS technology on the subfields of cartography and remote sensing has already been dramatic. The adoption of GIS technology by geographers will bring many benefits but also some problems. GIS technology is very technical in nature, but many geographers are not technically oriented. Conversely, many geography students are clamoring to learn GIS technology at the expense of their overall geographical education. A challenge facing geographers is to balance education so that technical subjects do not conflict with mainstream geography subjects. India is moving towards an information-based economy. Most future information will be in digital form. If geographers are to efficiently access this information, they must acquire tools like the geographic information system. Geospatial Technology is also commonly known as geomatics. The technology is used for visualization, measurement, and analysis of features or phenomena that occur on the earth. Geospatial technology is used in various organizations such as civilian, business, government, and military. The advancement of these technologies helps in the effective management of natural resources. These Technologies help in many applications like soil, geomorphology, hydrogeology, land use, agriculture, land records, urban, infrastructure development, water resources, watershed management, disaster management, health, education, security, and defence etc.

भू-स्थानिक प्रौद्यौगिकी में रोज़गार के नए आयाम

शशांक किशोर सिंह
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भूगोल के मूर्धन्य विद्वानों तथा शोधकर्ताओं की दार्शनिकता के मूल में नवाचार का अत्यंत महत्वपूर्ण योगदान रहा हैं जिसमें समय-समय पर अलग-अलग अध्ययन क्षेत्रों तथा प्रौद्यौगिकी का समावेश होता रहा हैं, जिसने इस विषय को और भी आवश्यक बनाने में महत्वपूर्ण भूमिका निभाई हैं I भूगोल के साथ - साथ मानविकी तथा विज्ञान के अन्य विषयों में प्रौद्यौगिकी का बढ़ता प्रयोग मानव तथा समाज के कल्याण में अत्यंत कारगर सिद्ध हो रहा हैं, साथ ही उद्योग, शिक्षा, स्वास्थ्य, पर्यावरण सहित अन्य क्षेत्रों की समस्याओं को सुलझाने तथा इन विषयों के नीति निर्धारण में भी इसकी महत्वपूर्ण भूमिका हैंI भौगोलिक सूचना तंत्र (GIS) तथा सुदूर संवेदन तकनीक (RS) जैसे आधुनिक तकनीकों की मदद ने न केवल भूगोल बल्कि मानविकी तथा विज्ञान के अन्य विषयों में हो रहे शोध- सर्वेक्षण में भी महत्वपूर्ण भूमिका निभाई हैं।

भू- स्थानिक प्रौद्यौगिकी ने बीते कुछ सालों में न केवल शोध बल्कि युवाओं के लिए रोजगार के नए अवसर भी प्रस्तुत किए हैं । भू स्थानिक प्रौद्यौगिकी की विभिन्न योजनाओं के निर्माण तथा ढांचागत संसाधनों के विकास में अहम् भूमिका हैं। उदाहरण के तौर पर, भारत में लोक सभा तथा विधान सभा जैसे चुनावों में उम्मीदवार तथा उनसे सम्बंधित जनसम्पर्क संस्थाओं द्वारा इस प्रौद्यौगिकी का प्रयोग बहुतायत में किया जा रहा हैं । यह संस्थाएं भू-स्थानिक प्रौद्यौगिकी का उपयोग कर अपने मतदाताओं के संकेन्द्रण का विश्लेषण करती हैं, साथ ही अपने उम्मीदवारों के प्रचार - प्रसार के मार्ग का भी निर्धारण करती हैंI यह जनसम्पर्क संस्थाएं तथा राजनीतिक दल भू-स्थानिक प्रौद्यौगिकी के जानकार युवाओं को रोज़गार

के अच्छे अवसर प्रदान कर रही हैं, भारत में IPAC जैसी संस्थाए इसमें अग्रणी हैंI विभिन्न सरकारी संस्थाएं एवं विभाग भी अपने नीति निर्धारण में भू-स्थानिक प्रौद्यौगिकी का बहुतायत में प्रयोग कर रहे हैं, जिसने इस प्रौद्यौगिकी के जानकार युवाओं के लिए रोज़गार के नए अवसर खोले हैंI वर्तमान में बिहार तथा कर्नाटक जैसे राज्यों ने भू-राजस्व तथा आपदा प्रबंधन जैसे विभागों में भू-स्थानिक प्रौद्यौगिकी के जानकार युवाओं को रोजगार प्रदान किए हैं। यह युवा राज्यों के भू सम्बन्धी नीति निर्धारण, उनके वितरण तथा मानचित्र निर्माण जैसे कार्यों में इन संस्थाओं की सहायता कर रहे हैं I राष्ट्रीय भू-स्थानिक कार्यबल रिपोर्ट २०१३ की अनुशंषा पर राष्ट्रीय पात्रता परीक्षा (नेट) तथा स्नातक अभिक्षमता परीक्षा (गेट) जैसी राष्ट्रीय स्तर की परीक्षाओं में भू-स्थानिक प्रौधौगिकी को एक विकल्प के रूप में शुरू किया गया है जो इसमें रूचि रखने वाले युवाओं के लिए रोजगार के नए अवसर खोलेगा एवम् यह प्रयास भारत के विभिन्न विश्वविद्यालयों में इस विषय के पठन-पाठन को भी प्रोत्साहित करेगा तथा इससे भू-स्थानिक पारिस्थितिकी तंत्र के विकास में भी मदद मिलेगी जिससे युवाओं के बीच इस विषय की प्रसिद्धि को भी बल मिलेगा I

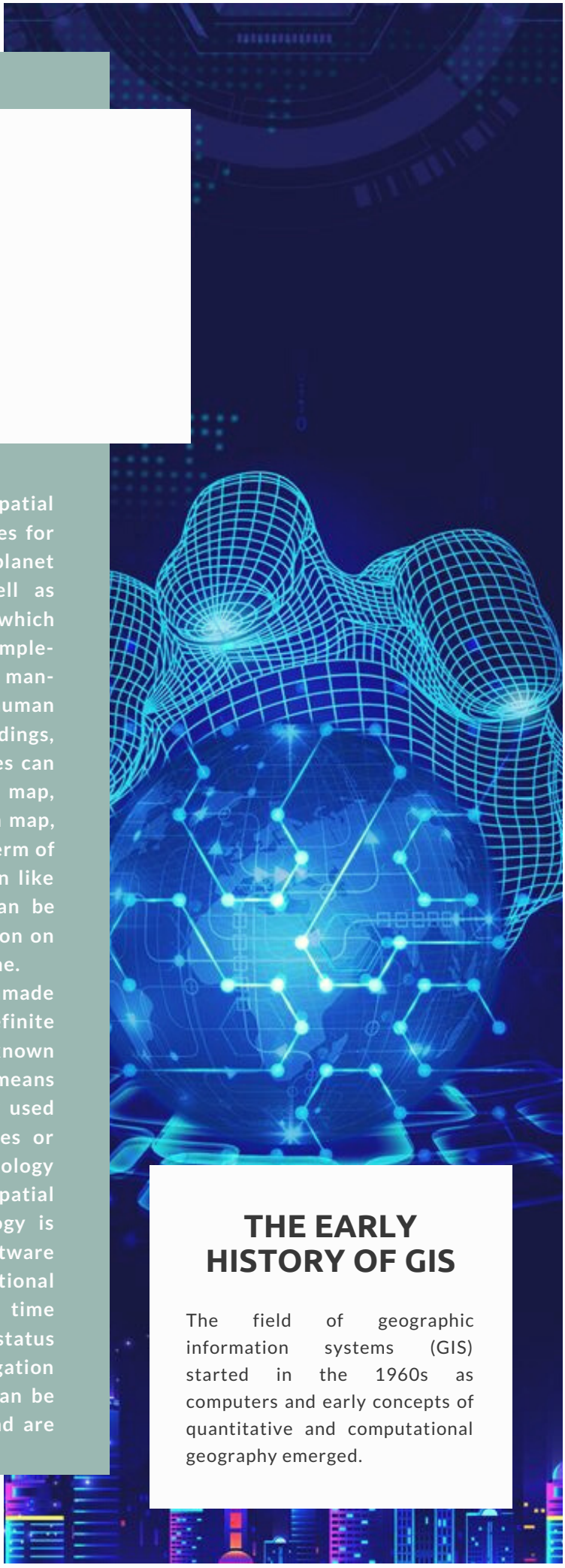
वर्तमान समय में समूचे वैश्विक परिदृश्य में भू-स्थानिक प्रौद्यौगिकी तथा कृत्रिम बुध्दिधमत्ता से जुड़े शोधों को बढ़ावा दिया जा रहा हैं, भविष्य में इन दो विषयों का मिलाप विभिन्न आपदाओं की रोकथाम करेगा तथा उनके प्रबंधन में भी सहायक सिद्ध होगा जिससे इस विषयों के जानकार युवाओं के लिए रोजगार के नए अवसर भी खुलेंगेI यह विषय सरकारी तथा निजी क्षेत्रों में रोजगार के अभूतपूर्व अवसरों के साथ - साथ नियोजन, विकास, तथा प्रशासनिक गतिविधियों का महत्वपूर्ण आधार है तथा यह प्रौद्यौगिकी इसके साथ - साथ राजस्व संग्रहण तथा संपत्ति के अधिकारों को भी सुनिश्चित करेगा। इस साल के शुरुआत में ही भारत सरकार के विज्ञान एवं प्रौद्यौगिकी विभाग द्वारा देश के भू-स्थानिक डेटा उपयोग नीतियों में व्यापक बदलाव किये गए हैं, जिसके अनुसार भू-स्थानिक प्रौधौगिकी से सम्बंधित आधार सामग्री अब भारत में स्वतंत्र रूप से उपलब्ध होगी जिससे भू-स्थानिक प्रौद्यौगिकी पर आधारित नवीन तकनीकों के अनुप्रयोग से कृषि, वित्त, निर्माण, ख़नन, स्थानीय उद्यम, ग्राम पंचायतों तथा नगर निगमों के कार्यान्वयन तथा नीति निर्धारण में भी मदद मिलेगी । इससे रोजगार भी उत्पन्न होंगे एवम् भारत सरकार के डिजिटल इंडिया तथा स्टार्टअप इंडिया के लक्ष्यों को प्राप्त करने में भी मदद मिलेगी I

CONCEPT OF GEOSPATIAL TECHNIQUES

BY: SANYA SHARMA

The earth is made up of various landforms. The Geospatial Technology captures, studies and analyzes these features for better management of resources. We are living on planet Earth, which is composed of various natural as well as manmade features. The natural features being those which were created by the natural process of the earth, for example- mountains, rivers, lakes, ponds, forest, soil etc. While the man-made features are those features which is made by human being himself, for example- roads, bridges, buildings, agriculture land etc. these natural and manmade features can be represented by various maps such as- topographic map, administrative map, physiographic map, road map, urban map, etc or can be seen with the help of computer system in term of various map data layers. Different layers of information like vegetation, water, forest, and soil of a same place can be shown on a single map by placing one layer of information on another and it can also show single information at one time.

All the features of the earth surface either natural or manmade occupy an area or space on the Earth surface and have definite geometric size and shape. Therefore these features are known as GEOSPATIAL where 'geo' means Earth and 'spatial' means definite shape and size in space. Geospatial technology used for visualization, measurement and analysis of features or phenomena the happen on the earth surface. This technology captures and stores the Geospatial data along with its Spatial and Non-Spatial information. The Geospatial technology is widely helps to describe the combination of spatial software and analytical methods with a geographic dataset. Traditional techniques to generate natural resources status is time consuming and expensive. The natural resources status includes area, production, productivity of crops, irrigation facilities and, rain fed area etc. these all information can be generated using GIS and Remote sensing technology and are cost effective and time saving.



THE EARLY HISTORY OF GIS

The field of geographic information systems (GIS) started in the 1960s as computers and early concepts of quantitative and computational geography emerged.

COMPONENTS OF GEOGRAPHIC INFORMATION SOFTWARE

BY: MAHIMA DABAS

Around six decades from now on, a past event (unexpectedly) resulted into revolutionizing the way we dealt with quantitative data. Nobody, could have guessed the wonders his findings would do in the future. Here, we talk of Sir Roger Tomlinson's creation of modern computer Geographic information system. It was while working on the Canadian land inventory in 1960s that he conceived an idea to create something that looked more like today's Geographic information system or GIS softwares, (as we know it) to help decrease his task period and outlay on the work. And so it did. Not only did it reduce the task period from long stretched years to some months but it shifted the heavy outlay of around 18 million Canadian dollars to some 2 million Canadian dollars, on the work of land use planning.

His profound legacy was continued by several technicians, academicians into designing various Geographic information system softwares. And this is how we get our present generation and quite sophisticated GIS softwares.

Geographic information software is a part of a packaged technology itself. This technology is called as geo spatial technology. It is an amalgamation of technologies of GPS (Global positioning systems and the like technology made for national or local levels), Remote Sensing (use of sophisticated devices to sense some remote area we are not in contact with, directly), GIS (Geographical information system, that deals with geographical information, while maintaining a database management system and using techniques like: Query, Modeling, Geo-processing, Geometric analysis tools and Computer-assisted cartography.

GIS uses the data which is remotely sensed for a place with its locational traits. It applies computer assisted cartographical techniques and other tools to make data versatile and extract and represent the required data. In this way all of it is integrated and is used for a particular aim.

Here we have components to Geographic information software technology, which are essential recipes to get the geographical analysis done in a sophisticated and most accurate manner. Those are:

• HARDWARE: GIS works best on computers and laptops. But the list is long for hardware. Based on the choices you make: mobile phone, network or desktop or laptop computer, palmtop, tablet etc.

• SOFTWARE: When you have the hardware to work upon, next thing that you will need is GIS software. It could be paid or unpaid.
To name few paid once; ArcGIS, GeoMedia, MapInfo Pro, Global Mapper. Among unpaid QGIS is the most popular and is widely used and some others in this list are; Open Jump and SAGA. Some softwares could be vector and others raster based on the data they deal with or deal best with.

• SKILLED PEOPLE: GIS requires people who have the skills to collect, produce, represent and analyze the information over the space and time. The work requires extensive knowledge (of how to analyze the data) and technical skills (of how to work with the data). All this can be achieved through a good training course. There is already a hierarchy in this area of specialty : Senior or junior GIS analyst, Administrator or manager of GIS project, GIS developer, etc.

DATA: Data is the most important raw material, after we get equipped with a hardware and software of our choice. Data is acquired for the area and subject of interest. It can be further categorized as spatial or non- spatial. Spatial data is the one that has a geographical extent ,the data collected using sensors at different platforms : satellites for high platform data which covers a very large areal extent with considerable detail and a small scale, a low platform data by techniques like unmanned vehicles viz. another name for drones, a small- in- dimension device with huge responsibility to collect detailed data in bird's view and then at the ground level are masts and scaffoldings which make remain in contact with land to collect data of small areal extent. All these techniques help overcome the limits set by human eyes regarding the bands it could detect, the area, details or even frequency at which it could see. Then we have non- spatial data that to supplement the spatial data by being attached to it. Like the names, business, dimensions or foundation plan of the building of companies that you could see in the map, etc.

• METHODS / PROCEDURES: There can be several routes to reach a particular area or a particular aim. In the same way, we can carry out works in GIS with different standards, methodology, rules and principles (that are particular to your organization) etc.

• NETWORK: This element is very important when you are working in collaboration with other research peers or transferring or retrieving data (baked or half- baked). It provides you with cloud computing facilities. However this is not so much extensively used when you are doing an individual task but forms an important part of data collection.

These elements are what you must have with you as these are the recipes for a perfectly done GIS tasks.

YOUTH, INNOVATION AND EMERGING OPPURTUNITIES IN THE GEOSPATIAL SPHERE

BY: EUREKA

"We cannot always build a future for our youth, but we can always build our youth for the future."
— Franklin D. Roosevelt

The youth of the nation embody strength, dynamism and intellect. They are actively leading the fore ground in all major fields. Youth of today, are filled with enthusiasm and endurance for a better and secure future. They are moved to be the driving forces of change. To continue to treat this majority as a passive member of society would be a sheer waste of potential and will.

In the words of John F. Kennedy 'The future promise of any nation can be directly measured by the present prospects of its youth'

India has an approximate 34.33% share of youth in total population by 2020. That is roughly two fifth of the total population. This is reason enough, why there is a need for new educational initiative in the field of technology and Geospatial techniques for children and youth.

Educating them in this field will create the unique responsibility of mobilizing, supporting and co-coordinating the efforts of both the government and general public.

Education, offers a great potential to build relationships between young people and authorities, instead of promoting an increased contempt which in turn creates alienation in society. We need a wider perspective and a more involved stand on data handling, Geospatial technology and promoting its impacts.

KNOW MORE:

GIS IS ABOUT UNCOVERING MEANING AND INSIGHTS FROM WITHIN DATA. IT IS RAPIDLY EVOLVING AND PROVIDING A WHOLE NEW FRAMEWORK AND PROCESS FOR UNDERSTANDING.
- JACK DANGERMOND
CEO, ESRI

THE PHENOMENAL EVOLUTION OF GIS FROM A RUDIMENTARY TOOL TO A MODERN, POWERFUL PLATFORM FOR UNDERSTANDING AND PLANNING OUR WORLD IS MARKED BY SEVERAL KEY MILESTONES.

GIS HAS BECOME A PLATFORM RELEVANT TO ALMOST EVERY HUMAN ENDEAVOR—A NERVOUS SYSTEM OF THE PLANET.

Geospatial technology is an umbrella phrase associated with a range of various technologies which include remote sensing, Global Positioning System (GPS), Geographic Information System (GIS), information technologies, and field sensors, that are intended to facilitate the process of capturing/storing/ processing/ displaying/ disseminating information tied to a location.

Firstly, it's important to provide youth with the knowledge to compile, analyse, and present geospatial data; this can be achieved in schools and colleges itself. Second, students have to be familiarized with various dimensions of Geospatial Technology and career opportunities available in these fields. Lastly, we have to develop creative thinking among students and make them technology-savvy so that they could be ready to join the Geospatial industry.

Geospatial technologies with proven capabilities for supporting decision making can effectively support governance, enable sustainable development, assist in better management of business process as well as bring location-based information closer to the people.

It is, perhaps, the only technology that can provide a holistic approach to the understanding of the interactions and inter-linkages between the earth's biophysical and social elements to strike an optimal balance between developmental and environmental goals. Geospatial technology is ubiquitous and the expanse of its reach in multiple fields is growing rapidly. Most technologies require a spatial component and it is one of the pillars of emerging technologies. Be it our day-to-day activities or cutting-edge futuristic research, none can be visualized without geospatial information. A vast range of career opportunities are available in this field. Following are just few of them-

Ø Geospatial Data Technician
Ø Geospatial Scientist
Ø Image Scientist/ Analyst
Ø Geospatial Developer
Ø Geospatial Programmer
Ø Geospatial Database Engineer
Ø Forensic Analyst
Ø Criminal Intelligence Analyst

Geospatial services industry in India is assessed worth 3 billion US Dollars and it is taking giant steps toward further growth presently contributing 0.2 per cent to the country's GDP. A number of huge geospatial projects have been launched by the national and state governments and applications of GIS for preparing all developmental plans has been made mandatory by several state governments. Serving to the changing geospatial needs of the country, maintaining current status of the industry and its further growth very much depends on the increasing availability of competent geospatial workforce. This offers lucrative attractions to the current professionals for enhancing their capabilities and enormous amount of opportunities to the young students to take standard education and training for making a career in geospatial sector.

As said by Late Dr. A.P.J. Abdul Kalam “Ignited mind of the youth is the most powerful resource on the earth, above the earth and under the earth”

Opportunities in this fast emerging field are far and many. Re-skilling of youth and investments to strengthen their technological skills will be essential to support sustainable development and resilience in the country. The significance of geospatial technologies and their applications in numerous fields are immeasurable. India realizes the importance and need for geospatial technologies and has been employing this indispensable technology in a big way for more than 15 years. However, the ‘geospatial technology revolution’ will emerge only with the involvement of young minds.

SPATIAL TECHNOLOGY AS CAREER

BY- RIMA

SPATIAL TECHNOLOGY

Spatial technologies refers to any software or hardware that interacts with real world locations. The GPS, google earth, GIS and satellite images are the most commonly used spatial technologies to visualize, manipulate, analyze, display and record spatial data. Spatial information science and spatial system is a rapidly expanding area, comprising of remote sensing from satellites, GPS, surveying, 3D computer visualization, mapping, and all forms of data with a geographic coordinate.

Cadastral or land surveyor:

Marks property boundaries and records the information on plans and maps. You must be licensed to do this work, as the plans you make provide the basis for legal transactions of land parcels.

Engineering Surveyor:

Surveys routes for railways, roads, pipelines, canals, sewers and tunnels and makes detailed surveys of construction sites, dam sites, multi-storey buildings and other engineering projects.

SPECIALISATIONS

- *CADASTRAL OR LAND SURVEYOR*
- *ENGENEERING SURVEYOR*
- *POSITIONING*
- *MINING*
- *REMOTE SENSING*
- *TOPOGRAPHY*

Positioning:

Uses signals from a multitude of sensors, among them satellites such as GPS, inertial measurement units, WiFi or other radiobased technologies, or electronic distance measurements such as SONAR or LIDAR, to locate positions accurately within a variety of environments.

Mining:

Measures underground and open-cut mines in detail. Creates surveys to help mining organizations locate new mines safely, avoid old mines, and allow connections to be made between different underground passages. Mine surveyors also establish the boundaries of mining claims in some states and territories.

Remote Sensing:

Uses digital data from high resolution satellites and airborne imagery systems to monitor changes on the surface features of the Earth.

Topography:

Provides information for the compilation of maps of physical features of the Earth's surface, such as hills, valleys, rivers and lakes, by making field measurements and taking aerial photographs. They work on, above or below the surface of the land or sea, and often work with other professionals.

JOB OUTLOOK

With a rapidly growing population, the need for geographers will become more critical than ever to ensure our cities have adequate transport, power, water, telecommunications and healthcare. Students are advised to begin building their employability skills to give themselves the best start to their careers.

Careers in Research

Graduate research enhances your ability to problem solve, think autonomously and creatively, and analyze. Careers in research are diverse and may include:

- **Academic positions at universities**
- **Policy-making or research positions at public sector organizations**
- **Private sector research and development projects**
- **Self-employed consulting positions on technical or policy issues in your area of expertise.**

Employability Services and Industry

Links Students undertaking programs have access to a range of employability services, and benefit from a curriculum that offers excellent opportunities to connect with industry through

- **An elective internship subject**
- **Student projects partnered with industry**
- **Guest lectures led by industry leaders and experts**
- **Site visits hosted by key organizations**
- **industry networking events**
- **career panels featuring industry representatives**
- **career question drop-in service**
- **an online jobs and internships portal**

Alternative Careers

Other areas in which graduates can move into are

- **Management consulting**
- **Finance, economics and banking**
- **Business analysis**
- **Project management**
- **Technical sales, marketing and communications**
- **Intellectual property management**
- **Technical writing**
- **Government and policy**

CONCLUSION

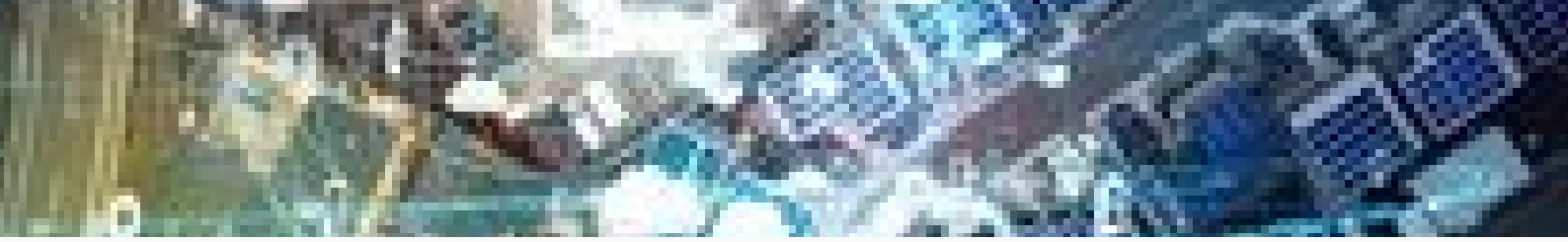
We can thus conclude that with reference to the demands of present time it can be predicted that, in coming future spatial technology is going to provide us good amount of career opportunities. Spatial technology enables us to acquire data that is referred to the earth and use it for analysis, modelling, stimulations and visualizations. It also helps us to make informed decisions based on the importance and priority of resources most of which are limited to nature.

TUSSLING GEOSPATIAL TECHNOLOGY

BY: BABY LIPIKA KUMARI

Mankind has created many marvels and geospatial technology is one of them. Geospatial technology is a recent technology which is a combination of cartography, GIS (Geographic Information System), Remote Sensing and GPS (Global Positioning System) which enables collection, storage, processing and interpretation of geographic data. Today, spatial analysis and mapping is used in every sector starting from business, emergency services, urban planning, and environmental management to policy making, etc.However, despite these opportunities and applicability several contemporary issues still pose challenges for geospatial technology.

. The geospatial revolution is regarded as "a revolution of perspective"since it has transformed descriptive geography into digital geography over the period of time.



Contemporary Challenges of Geospatial Technology

The challenge of geospatial technology is two-fold

- From user's perspective
- From producers perspective.

CHALLENGES FACED BY USERS

The stakeholders or end users face the following challenges which hinder accessibility and affordability of geospatial data.

Lack of awareness

Lack of awareness among the customers about the varied application of geospatial technology (which emerges due to lack of popularity) makes it harder for them to use the geospatial tools.

High cost of accessing geospatial data

Financial hardships particularly in developing countries put a barrier for users to afford geospatial data. The numbers of open source softwares (like QGIS, etc.) are few and most of the geospatial tools have licence costs. Also, geospatial technology requires hardware and uninterrupted internet access which is a challenge in remote areas.

CHALLENGES FACED BY DATA PRODUCERS

Barriers in data collection

Data acquisition of underground assets have become difficult because they are hard to locate. Similarly, buildings of highly urbanized areas, dense forest, and cloud cover block and bounce back signals, distorting accuracy in satellite and aerial photographs.

Poor standard of data

A study of The GEO Network for Capacity Building (GEO-Net-CaB), 2011 identified several common problems with the usefulness of geospatial data like many information cannot be accessed or is otherwise not available; information is accessible, but not reliable for development in different fields; the data cannot be processed in a way that supports the decision-making process; the data is shareable, but not timely updated.

Legal Constraints and lack of coordination

Restrictions makes procurement process a long, expensive and hectic task. Several governmental agencies often buy expensive high resolution satellite images but do not share them with other government agencies, unless there is an external pressure to do so.

Shortage of trained staff (human resource)

The field of geospatial technology requires specialised skill and knowledge because complex problems are hard to be solved by a layman. The inadequacy of skilled professional to effectively use and maintain geospatial technologies is the result of insufficient capacity-building resources.

Lack of training/ capacity building programs

Continuous training is needed to ensure that expert's skills do not become outdated and don't fail to cope up with the potential demand of geographic data. This situation of insufficient capacity building varies spatially. According to studies, only 50 economies representing 75% of the world's population and 89% of the world's GDP (Gross Domestic Product) have been ranked top in "Countries Geospatial Readiness Index" where United States rank 1st followed by United Kingdom, Netherlands and Canada due to their sophisticated and geospatial innovative society. On the other hand Zimbabwe, Bangladesh and Kyrgyzstan rank as beginners in the same.

Dependency on crowdsourcing

Crowdsourcing is a bottom-up initiative which means to acquire data or opinions from a large group of people who share their data

on the Internet either voluntarily or as a paid professional. Despite being a quicker and cheaper many crowdsourcing platforms such as *"Open Street Map (OSM)"*, "*Google Earth*", and "*ArcGIS*" require verification of accuracy and authenticity of data supplied by the crowd.

Requirement of research

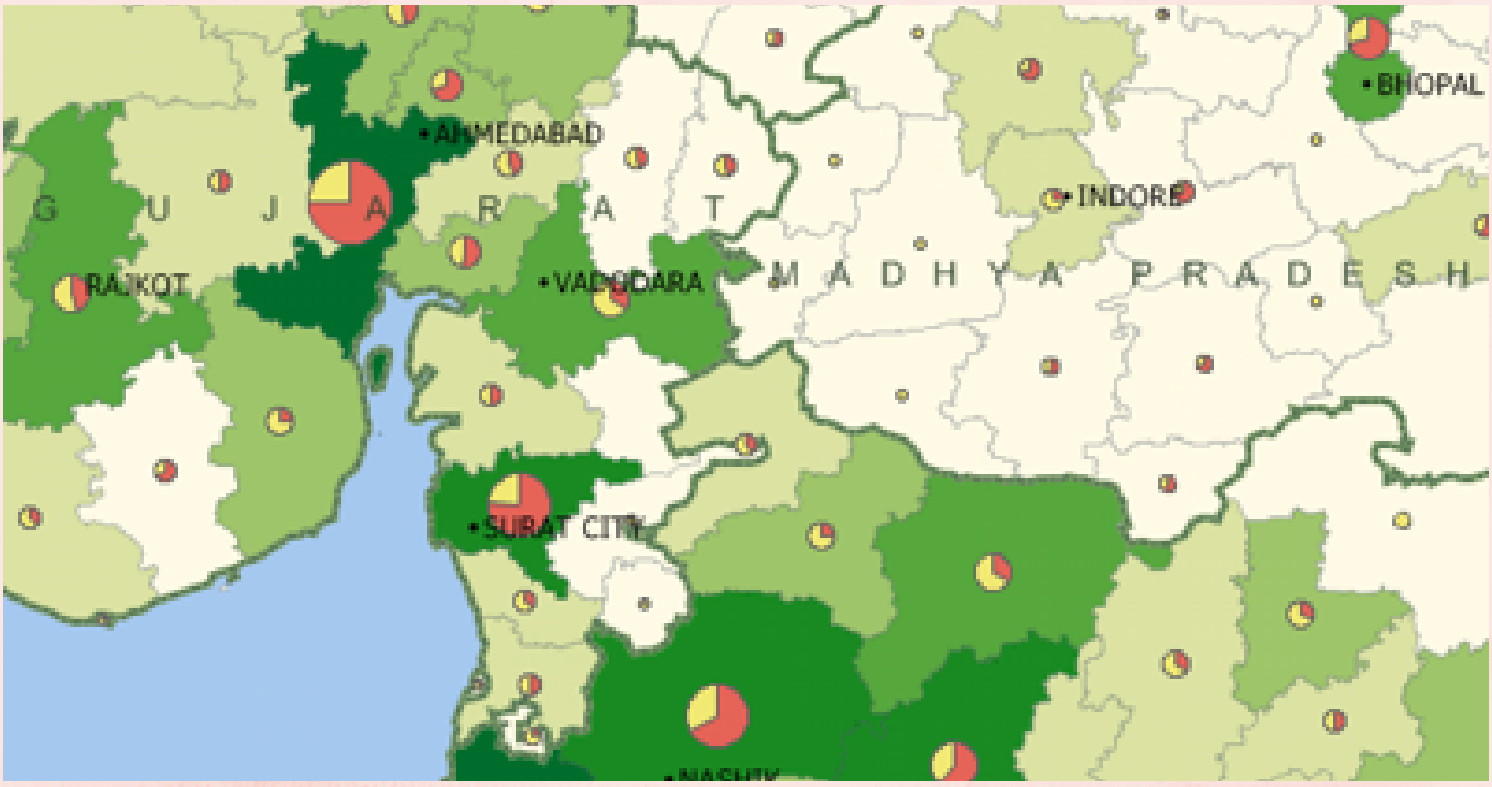
Several skill development programmes and research projects are short term and fail to leave any imprint behind when they are completed. Thus, significant long term and multidisciplinary research is still needed in order to understand the changing viewpoint of people about this technology.

NEW MAPPING POLICY OF INDIA: A STEP FORWARD TO MAKE GEOSPATIAL DATA ACCESSIBLE

The "Department of Science and Technology" on 15th February 2021 under the "Aatmanirbhar Bharat Scheme" announced the New Mapping Policy with the aim to liberalize the restrictions on procurement of geospatial data by general public. It is a collaboration of ISRO (Indian Space and Research Organisation) with MapmyIndia to produce applications like Google earth and Google Map, etc. indigenously in order to make India self-reliant. Under this scheme all the geospatial data collected by governmental institutions like the Survey of India, security and law enforcement agencies will be freely available for public use with no security clearances.It will promote research to make high resolution maps, create massive employment, improve ease of doing business, encourage start-ups, aid the traditional sectors like agriculture, mining, and a flood of geospatial information will make life easier.

INDIA AS A PIONEER COUNTRY IN GEOSPATIAL TECHNOLOGY

BY MOHIMA MAZUMDER



Do you know?

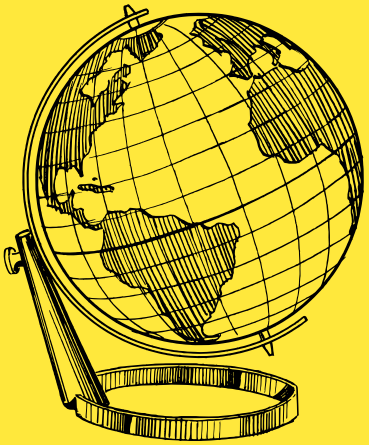
1783- Two Europeans, Marquis d'Arlandes & Pilatre made a voyage near Paris using a balloon.

1926- In India an aerial photograph was first used for flood assessment of Indus river

1960- First meteorological satellite was launched named as "TIRSO-1"

Modern tools which contribute to the geographic mapping and analysis of Earth and human societies can be referred to as "Geospatial Technology". The art of photographic interpretation was accelerated during the Second World War and it was during the Cold War that it took new dimensions with the advent of satellites and computers. India is among the key engines of global economic growth and progress on development goals. India is the world's 7th largest economy, growing second fastest among large economies after China, and is projected to be the world's second-largest economy by 2050. India ranks 26th among 50 nations covered in the CGRI 2018, and as a major economy fare much poor compared to the other emerging nation economies – including China, which are the key to shaping the future of global economy and development. Sujeet Kumar, Vice President, and Head Asia Pacific Utilities and Geospatial say, "Geospatial data plays a vital role in the decision-making process across a range of industries. Therefore, accessing, sharing and using the geospatial data forms, the essence of geospatial infrastructure." Geographic Information System has application in almost all walks of human existence.This technology is

therefore relevant to a multitude of sectors be it be in agriculture, telecommunications, infrastructure, logistics, etc. Geospatial technologies as a tool for decision making can add immense value to planning and development. This multifaceted technology can effectively enable sustainable development, assist in better management of the business processes as well as bring location-based information closer to people. Major IT companies have started dedicated practices in geospatial technologies. GIS is the core platform of many critical infrastructure and development projects worldwide and serves as a valuable tool for civil society. Businesses today are increasingly adding a spatial dimension to data to help make critical decisions. India offers several advantages which enhance the prospects for this industry manifold. The Government has wholeheartedly accepted this technology as being pivotal in facilitating good governance. State government departments are more aware with respect to the benefits and are gradually emerging as the major users. India is recognized for its IT skills and space programs. It offers good infrastructure and expertise for the collection of geospatial data. Players in this domain are already providing solutions to several end-users thus propagating the utility of the technology. Several transnational companies have outsourced their operations to India in order to harness significant technical expertise in the geospatial sector.Large numbers of institutions in the country provide courses in geospatial technology and applications to sustain a technically sound human resource base. India, the tourism industry is one of the largest jobs creating industries and accounts for 6.23% of the national GDP, making it the highest contributor second only to the oil and gas industry. But there are umpteen challenges - the prominent ones being infrastructure, growth in skill, promotion, and marketing at global levels, imparting of education related to tourism, or improving the expertise in service management. To address all of the above challenges, one of the major needs of tourism is to have accurate and up-to-date information in geospatial platforms on related entities so that different maps, GIS data, and applications can be generated for the tourism industry. GIS can be very useful in tourism for facilitating, planning, and monitoring the services including facilities, activities and to deliver a prompt response to the tourist needs. In addition to developing and maintaining road networks, geospatial technology is also being used in traffic management. for example Bangalore Metropolitan Transport Corporation(BMTC) is using GIS/GPS technology for fleet management. Over 1,000 BMTC buses, including all the 50 Volvo buses are GPS-enabled. Synchronized by GPRS, a public information system (PIS) has also been developed. Geospatial data usage in India is supported to a large extent by initiatives set out by the central government through its ministries and various departments. especially in 160+ projects, wherein the departments concerned have been asked to closely work with the Indian Space Research Organization (ISRO) and its data center National Remote Sensing Centre (NRSC). These initiatives, along with state and local level initiatives have the potential to transform the very future of India. In 2012, the National Institute of Advanced Studies IISC, Bangalore was given the first charter to release a draft geospatial policy. Since then, the country is striving to put forth a comprehensive policy and till date, only a draft version of the National Geospatial Policy (NGP) is in place. India is and definitely will be using geospatial technologies to its optimum



FUTURE OF GIS

-BY CHERRY

A geographic information system (GIS) is a computer-based tool for mapping and analyzing things that exist and events that happen on Earth. GIS technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps. These abilities distinguish GIS from other information systems and make it valuable to a wide range of public and private enterprises for explaining events, predicting outcomes, and planning strategies. Map making is a way older process and is going on since so many years but manually as the time passed, the way of making maps has been improved. Now GIS is the most prevalent way of map making as it has made the process more accurate and detailed.

The future of GIS will be more brighter, detailed and more appropriate. GIS technology, only a few people had the skills necessary to use geographic information to help with decision making and problem solving. Over the past four decades, GIS technology has systematically effected local government by improving basic record keeping and data management as well as automating a wide variety of geospatially-related workflows including mapping. Most of these improvements have been in departmental systems focused on specific mission areas.

GIS does not only help in making maps but also the data management of various organizations is done with the help of GIS Technology. As the population of the cities are increasing and the developmental process is also turning rapid due to which there will be improvization in the technologies. GIS is being more widely recognized as a powerful platform for local governments. Its ability to manage, integrate, analyze, and visualize very large and complex data is making it an essential platform for creating the sustainable cities of the future.Cities will increasingly make their information available as open geospatial services (maps).

These maps will help tell stories about the state of those cities and the policies they have adopted. All transactions and changes will be illustrated virtually, resulting in citizens who are both more informed and engaged.

Being a part of the world where GIS would be at peak, imagine how data for various things would be accurate with the developing world, understanding risks and impacts of events happening. Geospatial technologies enhance the performance of artificial intelligence and smart machinery in various spheres and agriculture in particular. Remotely controlled equipment completes numerous tasks via GPS and digital dashboards. Robots and smart machinery in the fields seem futuristic no longer, and it is not the limit.

The technologies find new implementations, and related researches go further. They are affordable for a wide audience, and their practical use inspires a greater spectrum of applications in the future. The reason for their popularity is in data accuracy, which means better precision and, thus, increased productivity. The development of geospatial technologies brings quite an interesting correlation onto the scene. New achievements in this branch means the corresponding upgrade of related industries. So, the improvement process is not likely to stop, ensuring even greater precision, credibility, performance, quality, and security

FACT CHECK

As noted by a market analysis in August 2017: "The GIS Market was valued at USD 5.33 Billion in 2016 and is expected to reach USD 10.12 Billion by 2023, growing at a compound annual growth rate of 9.6% between 2017 and 2023"

DRONES: AN ENDLESS AMELIORATION

BY: UDITA TRIPATHI

Geospatial technology can be defined as " The range of modern tools contributing to the geographic mapping and analysis of the Earth and human societies."

Geospatial Technology has changed the world surpassingly. Anyone around the globe can just sit at their places and can still be present at any place in the world. GPS was started in the mid-1960s for the military purpose for US Navy to track US submarines carrying nuclear missiles but today we are using it to reach our nearest stores as well. Today we have more than a thousand Geospatial technology systems and their number is still increasing day by day. It not only provides data from outside space but also from the smallest town on our planet. A lot of research has been possible only because of Geospatial technology because it provides a wide range of cost-efficient to extravagant technology due to which it is affordable for smallest to the largest organization as well as purpose. Geospatial Technology includes Geographic Information System (GIS), Remote Sensing (RS), and Global Positioning System (GPS). It has a wide number of uses in day-to-day life as well as in various fields like Military, Delivery, Emergency Rescue, Outer space, Wildlife conservation, Historical conversation, Medical Technology, Disaster Management, etc.

All these things are possible solely because of Drones. The use of drones in search and rescue operations, mapping and surveying, and in other civil applications such as policing and firefighting, has increased in the 21st Century. It can be also used to capture images of areas in which the man can't pass through. Today, the application areas of drones are limitless. This technology was further developed after World War I and came to be known as drones several years later. A drone has its wide use in itself. During disasters or before any natural disaster it's now much easier to rescue people. A drone is the main component of Remote Sensing and is cost-effective due to which its application in daily life is increasing. Drones are being used widely in photography and it is also helping in the military to keep an eye on the enemy. In the 2019 surgical strike by the Indian army, Drones played a very crucial role.

On the other hand is the possibility that drones may be misused for illegal activities like espionage, trespassing, photography, hacking other devices, unauthorized surveillance to track the profiles or to aggregate personal data of people by either states or private agencies, and penetrating test networks to collect unencrypted data or establish fake access point. These can have serious threats to privacy and consumer power. However, the pros outnumber the cons by a huge margin. Besides, every coin has two sides and the duty falls on our shoulders to make positive use of the technology. Besides, the benefits outnumber the shortfalls.

APPLICATION OF GEOSPATIAL TECHNOLOGY IN DISASTER MANAGEMENT

By Anjali Solanki

Geospatial information systems (GIS) are analytical, data management, and visualization tools that are built so the right information can be rapidly understood. For all phases of emergency management — preparedness, response, mitigation, and recovery — GIS technologies can improve how we respond to extreme weather events and manmade hazards. GIS can help local authorities, corporations, and emergency responders.

Contextualized information allows us to understand data. Our eyes glaze over while reading a spreadsheet with thousands of cells, but we can quickly grasp a pie chart or a line graph. "Up and to the right means growth" is much easier to comprehend and present to others.GIS technologies provide spatial awareness to improve response times for local and state governments, support organizations, and impacted parties (e.g., utility companies, manufacturers, real estate, retailers). In addition, GIS helps communicate the locations and best routes to emergency evacuation centers, as well as provide critical information on road closures and at-risk zones. Spatial awareness is also valuable in preparedness and recovery efforts. Visually presenting where certain locations are lacking emergency response resources compared to climate risk can allow policymakers and governmental agencies to identify which areas need the most attention prior to or following a catastrophic event.

Sudden changes in weather patterns can drastically change emergency response paths and supply chain routes. From wildfires

Do you know?

Galileo Galilei (an Italian astronomer, physicist, and engineer, also known as the "Father of observational astronomy"), used a telescope for discovering the celestial bodies. He said that "Sun have spots, Moon is not perfect in shape and have some imperfections & milky way was composed of a myriad of faint stars.

to floods, the safety of first responders, company personnel, and community members is dependent upon real-time tracking of wind speed and direction.GIS integrates data from a variety of sources and formats, including real-time information. As updates come in from the National Weather Service, on-the-ground responders, and government agencies, GIS technology immediately analyzes and highlights the highest risk areas. Leveraging this analysis, emergency management teams can promptly identify and dispatch the nearest units to specific areas, as well as the model where more resources may be needed as the situations progress.

GIS frameworks centralize and organize data maintained across a wide variety of agencies, organizations, and institutions. Especially when coupled with monitoring devices such as drones or remote sensing devices, GIS can project how the data interacts with one another. Bringing all this data into one geospatial map presents a clearer picture of all the contributing factors to proper short- and long-term preparedness, as well as a swift system to analyze how certain relief efforts may impact other elements of direct response. It can bridge corporate resources — for example, building design plans — with emergency response teams to improve rescue operations and decrease potential damage.

GIS serves as a supportive tool to relay information in a way for the public to easily comprehend and act on ongoing warning or emergency notifications. Showcasing the scale of damage through geospatial mapping can also improve outreach efforts and drive greater attention to improving future relief efforts. Visually representing what resources are nearby (or what's not) before, during, and after a crisis can convey to others the seriousness of a situation much more clearly than a collection of data grids.

During the SARS outbreak 17 years ago, geospatial technology played a very important role in boosting response efforts. With the advancement of GIS technology, it can play a greater role in descriptive, predictive, and prescriptive stages of combating COVID- 19. Through the signaling Big Data of mobile phones, by obtaining personnel activities information between different regions to further predict and analyze the epidemic development and to develop corresponding prevention strategies. Furthermore, through the epidemiological investigation of the confirmed cases and the personnel movement track analysis of mobile phone signaling with permission, the people who came in close contact with those infected can be found and tracked, which can contribute to the formulation of more elaborate prevention and control measures. Some examples of spatial information/technologies being used successfully to combat COVID-19 are mapping of cases, mapping of spread, mapping vulnerable populations, etc.

GIS technologies are not new to emergency management, but widespread adoption has yet to fully take place. Even as governments invest in GIS to support emergency operations, further use and data aggregation can provide massive improvements in addressing future climate risk scenarios. Therefore, it's essential for both public and private organizations to make a greater investment in and encourage the adoption of GIS to ensure the disasters of the future are less catastrophic.

APPLICATION OF GEOSPATIAL TECHNOLOGY IN TOURISM

BY : AYESHA KHAN

The main elements of tourist resources may include natural resources, tourist and other infrastructure, demographic data, information on sites of cultural heritage and more. GIS in this case can use its ability to integrate, store and manipulate different types of data, qualitative and quantitative, spatial and non-spatial. Tourism mostly uses GIS to determine the suitability of sites for tourism development.

Earlier, we had travel brochures to identify famous places about a particular state but now these days we have a large chunk of information about places which we usually obtain from internet sources but there are still some problems like finding the most accurate information. The vast amounts of information are not only confusing but consume a lot of time as well. To overcome these issues GIS has been applied in the tourism industry. Accurate details of the area the tourist wishes to visit can help them enhance their experience and helps them understand the culture and values of the people living in the area. Tourism planning requires collecting and processing as all locations should be defined and analysed within a spatial context. For this purpose, GIS can describe and identify tourism infrastructure elements. The development of tourism is inevitable and GIS is helping tourism in efficient information management and exchange.

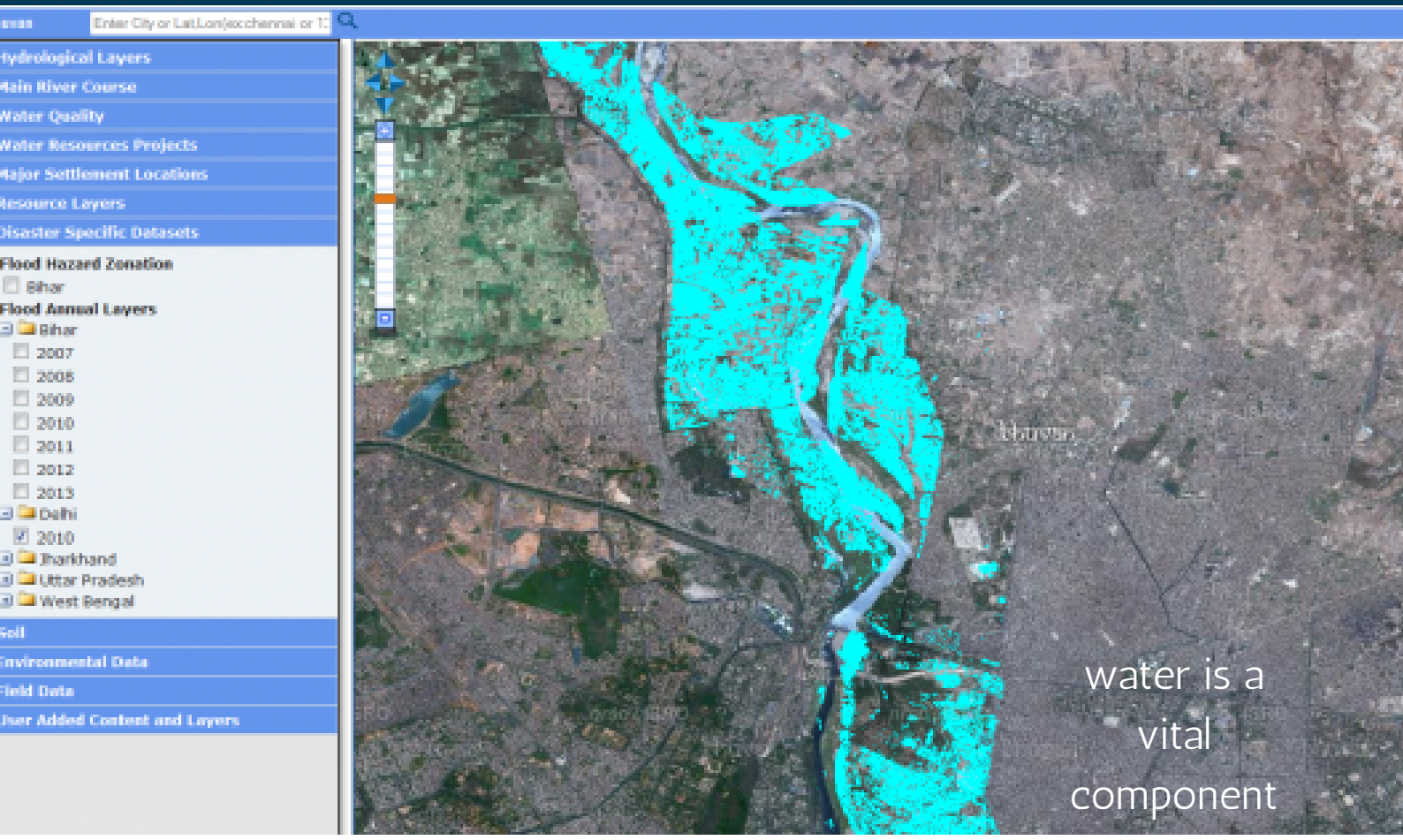
Use of land, availability of infrastructure, natural resources are the basic geographic variables used to determine the potential and capacity of the city or area as a tourist destination. With the help of GIS, it is easier to define locations which are according to accessibility, capacity and quality, possible locations for organizing tourist activities. GIS not only provides information on tourist attractions, but it is a database of geographical conditions, transportation, accommodation, ethnic groups of the population and more. GIS technology offers great opportunities for the development of modern tourism applications using maps. GIS produces thematic maps which can help tourists understand their destination in a better and detailed manner .GIS application in tourism opens up new avenues and enhances tourist experience.

DID YOU KNOW?

ISRO -Indian Space Research Organisation
IIRS -Indian Institute of Remote Sensing

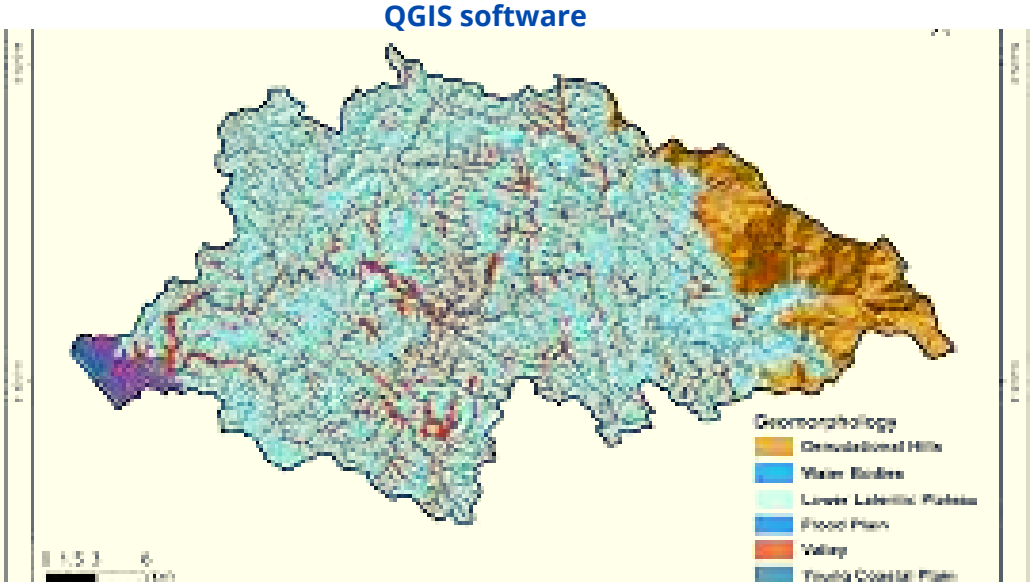
APPLICATION OF GEOSPATIAL TECHNOLOGY IN THEFIELD OF HYDROLOGY

BY-NAZNEEN SULTANA



There are evidences to prove that though the natural warming of the Earth takes place, human actions have accelerated this process manifold. This and other related phenomena are addressed as 'global climate change' problems. The threats are not only from the gradual rise in global temperature and sea level but the redistribution of heat over the Earth's surface. Some spots will warm while others will cool. These changes, and the accompanying shifts in rainfall patterns, could relocate agricultural regions across the planet affecting people and global biodiversity.

This image shows the drainage pattern of an area using the QGIS software



Most of the hydrological processes are dynamic, not only between years, but also within and between seasons, and therefore require frequent observations.

Geoinformatics offers a synoptic view of the spatial distribution and dynamics of hydrological phenomena, often unattainable by traditional ground surveys. Radar has brought a new dimension to hydrological studies with its active sensing capabilities, allowing the time window of image acquisition to include inclement weather conditions or seasonal or diurnal darkness.

Some examples of Hydrological applications are-

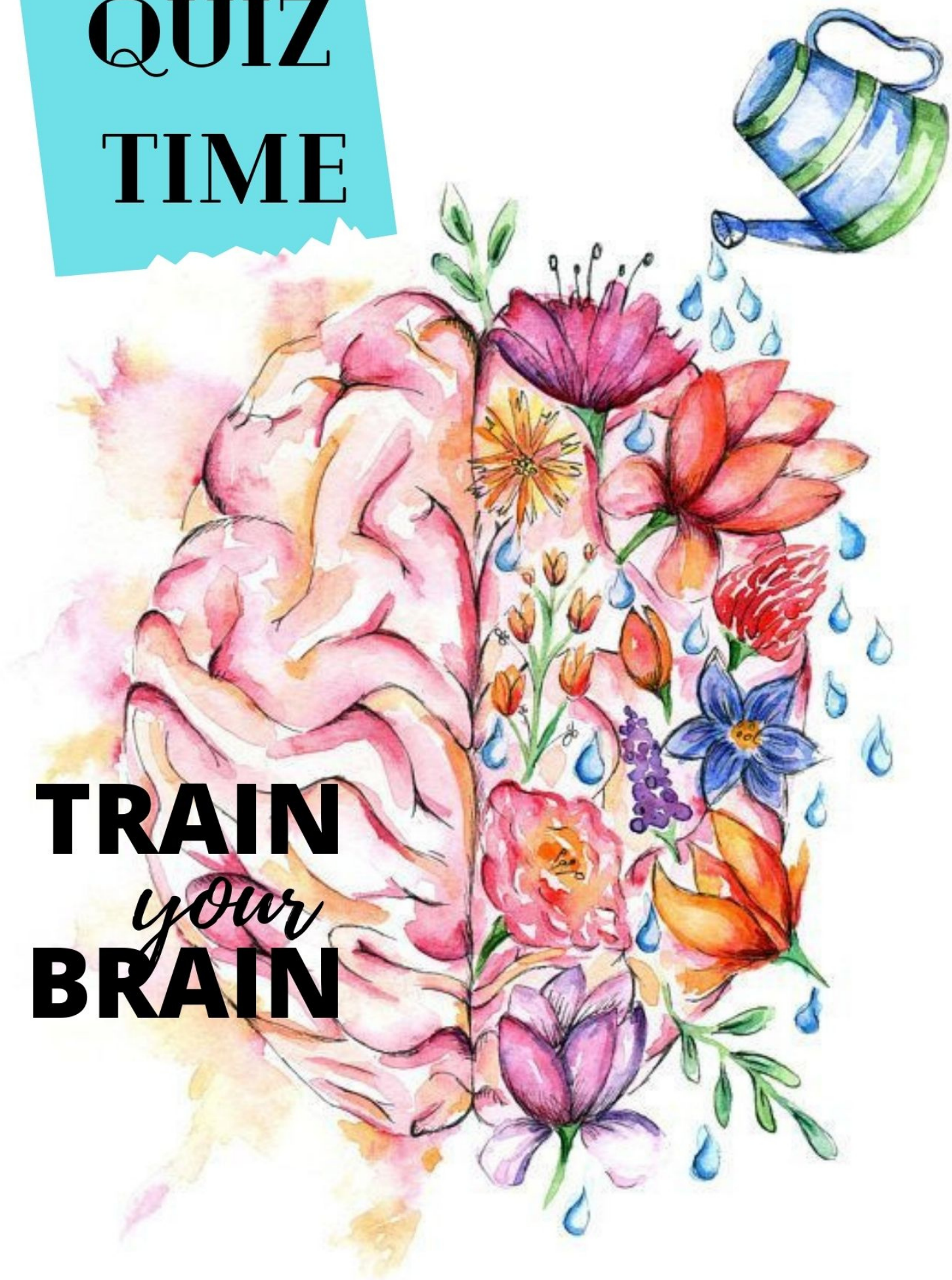
- Wetlands mapping and monitoring
- Water quality monitoring
- Snow pack monitoring
- Measuring snow thickness
- River and lake ice monitoring
- Glacier dynamics monitoring
- River/ Delta change detection
- Irrigation canal leakage detection
- Flood mapping and monitoring
- Soil moisture estimation

Geospatial infrastructure is enabling a whole new era of maps and language of understanding. While GIS started with specialists, today, maps are dynamically served to millions of users through browsers and mobile devices

Being a tropical country India is prone to floods. Traditionally gathering and analyzing hydraulic and hydrologic data related to floodplains and river catchments has been a time-consuming effort requiring extensive field observations and calculations. With the development of geoinformatics and computer analysis techniques, traditional techniques can be supplemented with these new methods of acquiring quantitative and qualitative flood hazard information. Most of the flood-prone rivers in India change their course frequently after every flood causing enormous damage. It is, thus, essential to understand the behaviour of the river and its latest configuration to plan flood control measures It is also important to monitor the existing flood control structures periodically to avoid breaches because of the frequent changes in river configuration.

Due to the worst behaviour of humans on Earth's surface, urban flooding is an inevitable problem in many cities and is on the rise. Wetlands are also affected due to an increase in the demand of land for developmental purposes and this purpose leads to a decrease in the proportion of rainfall that infiltrates into the ground and a consequent increase in surface runoff, in terms of both volume and flow rate. Urbanisation has changed the natural run-off pattern and accelerated the transport of water, pollutants and sediment from the urban areas. One of the typical features of urban flooding is shortening the runoff travel time making it a flash event. The continuous development of urban settlements necessitates data on flow rates, physical and topographical settings for more periodic assessment, and monitoring to cope up with stormwater flooding. Recent advances have greatly enhanced the satellite remote sensing data capabilities in supplementing the data needs for the management of urban flooding.

QUIZ TIME



TRAIN *your* BRAIN

Quiz on Geospatial Technology

BY DISHITA PRASAD, DANIYA SULTAN, MITANSI TOSHINWAL

1. GIS stands for-
A. Geomorphic Information System
B. Geographic Information System
C. Generic Information System
D. Geographic Interpretation System

2. The first computerized GIS system was invented in _____.
A. 1967
B. 1980
C. 1963
D. 1978

3. Dr.Roger F. Tomlinson is known as
A. Father of GIS
B. Founder of ESRI
C. Father of Geospatial Technology
D. Father of Remote Sensing

4..The type of Geospatial data created by people who are not necessarily professional Geographers are sometimes called:
A. CGD(Cached Geographic Data)
B. FBOD(Facebook-Oriented Data)
C. WIKI(Well-informed Kinetic Information)
D. VGI(Volunteered Geographic Information)

Today the picture of GIS is quite artistic with respect to technology. But the first of it's kind of GIS was invented in Q5____ and the credit goes to Q6_____. When Paris was hit with Q7___ outbreak he created a Q8_____ map to note and observe the illness and the place where it was concentrated. He then used spatial analysis to find the relationship between the disease and it's cause.

5. The year
A. 1830
B. 1834
C. 1832
E. 1868

6. Name the cartographer
A. Charles Picquet
B. Aristotle
C. John Snow
D. Nicolas de Fer

7.Name the disease.
A. Dengue
B. FLU
C. Cholera
D. Jaundice

8. Name the type of Map he used to mark the incidents of illness concentration
A. Heat map
B. Choropleth map
C. Dot map
D. Topographic map

9. UBER- a cab providing app that depends upon Geospatial Information was first launched in?
A. London, UK
B. San Francisco, USA
C. Seoul, South Korea
D. Toronto, Canada

10. URISA stands for-
A. Urban and Regional Information Systems Association
B. Universal and Regional Information Systems Association
C. Urban and Regional Information Systems for Address
D. Universal and Regional Information Systems for Address

11. TIN stands for
A. Traffic Internet Network
B. Triangulated Interface Network
C. Temperature Interface Node
D. Triangulated Irregular Network

12. SDI stands for
A. Spatial Data International
B. Spatial Data Infrastructure
C. Spatial Data Intention
D. Spatial Data Interface

13. DBMS stands for
A. Database Management Software
B. Database Management System
C. Database Manufacturing System
D. Database Mixing Station

14 The type of Geospatial data created by people who are not necessarily professional geographers are sometimes called:
A. CGD(Cached Geographic Data)
B. FBOD(Facebook-Oriented Data)

C. WIKI(Well-informed Kinetic Information)
D. VGI(Volunteered Geographic Information

15. Mapping as a service market size is expected to be worth in excess of $8billion by which year?
A. 2030
B. 2025
C. 2022
D. 2023

16. What is the full form of lidar?
A. Light detection and ranging
B. Light detection and ransom-ware
C. Light developer and real-time
D. Light developer and ranging

17. _____ is the feature that uses microwave pulses to create imagery of features on earth.
A. Radar
B. Lidar
C. Arial photography
D. Space capsule

18. How many minimum numbers of satellites are required to calculate 3D positions?
A. 1.
B. 2
C. 3
D. 4

19. The headquarters of URISA is at-
A. San Francisco, California
B. Des Plaines, Illinois
C. Washington, DC
D. Toronto, Canada

20. Who was the founder and president of ERSI, a computer-based mapping and analysis mapping system, which now is a global market leader in GIS and Location Intelligence?
A. Jack Dangerwood
B. Laura Dangerwood
C. Dr. Roger F. Tomlinson
D. Fra Mauro

Word Hunt

SWARNALI KARMAKAR, SANCHI JAIN

A	R	Y	A	B	H	A	T	T	A
G	O	O	G	L	E	M	A	P	S
X	B	D	C	V	W	S	T	O	A
T	E	I	M	Z	D	X	B	N	T
P	R	A	J	U	C	M	Y	A	B
R	O	M	T	R	I	T	O	N	L
O	N	S	P	U	T	N	I	K	R
G	B	X	A	S	T	O	S	A	T

1. NAME INDIA'S FIRST SATELLITE.
2. NAME WORLD'S FIRST ARTIFICIAL SATELLITE.
3. WHO INTRODUCED GIS?
4. NAME THE LARGEST NATURAL SATELLITE OF THE PLANET NEPTUNE.
5. NAME INDIAS'S FIRST PICO-SATELLITE.
6. NAME A SPACE WEAPON WHICH IS DESIGNED TO DESTROY SATELLITE FOR MILITARY PURPOSE.
7. WHAT WAS INDIA'S FIRST MULTI WAVELENGTH SPACE OBSERVATORY.
8. NAME NATURAL SATELLITE OF THE URANUS, DISCOVERED BY W. HERSCHEL.
9. GPS IS CONTROLLED AND OWNED BY WHICH COUNTRY?
10. WHICH MOBILE APP IS FREQUENTLY USED AS GPS?

WORD PUZZLE

BY: NIKITA

N P P C H T G N E L E V A W W
H O L N L W L A R O S N E S G
Q N A A Y I C M O H F D R L G
E L A C S C P E G A E R Z C I
L J O C U P R S O F T W A R E
R W P R R A A D L X K E Y E E
M E A D W A N M Z D E N T M A
W C V D A E A M M Y S O D I I
Y P R R G T C E H W M A D E Q
P A I E E J A T T E E E S D U
H C L X B S E H R Z M Z L G Z
D H K L E G X O S O D S O M Q
L I R K K L H D E Y K A P V W
S E N S I N G G Z L B T E H J
M E R I D I A N D L E R V K D

Accuracy
Arc
Clip
Data
Geomedia
Hardware
Legend
Map
Meridian
Method
Pixel
Remote
Scale
sensing
Sensor
Server
Slope
Software
Wavelength

POETRY

आविष्कार का दौर

आविष्कार के दौर में,
तकनीकियों को बढ़ाना हैं...

मंगल तक जा पहुंचे हैं
भूगोल का ही तो खज़ाना हैं ।
नक्शे तो इतिहास के मांगने हैं,
पर जी. आई. एस तो आज का ज़माना हैं ।
आविष्कार के दौर में,
तकनीकियों को बढ़ाना हैं ...

समुद्रों को तो नाप लिया,
पहाड़ों से भी विशाल हैं।
पर सुदूर संवेदन और उपग्रह बिंब
तो पूरे ब्रह्मांड का कारनामा हैं ।
अविष्कार के दौर में,
तकनीकियों को बढ़ाना हैं ...

धरती के भीतर की हलचल को
प्लेट विर्वतनिकी से समझाना हैं ।
बढ़ती जनसंख्या को हमने,
जनसांख्यिकीय मॉडल से बताना हैं ।
यह दौर हमारा तकनीकियों वाला हैं,
भूगोल से ही इसे बताना हैं....

.....शिवानी यादव

I AM GEOSPATIAL

BY JYOTI

I AM GEOSPATIAL TECH
I am everywhere, You may not observe,
But I am both here and there.
Connecting, Innovating and threading things together,
I bring you directions,
Making lives: efficient and faster.
I am the 'digital thread',
I connect you with the real world
I help you see what belongs where,
When I integrate and visualize enormous data.
For better decision making
I help you save water,
I help you optimize agricultural ecosystem.
I help you to save biodiversity.
I am the backbone of every smart city.
I have tracked, traced and located,
Every point of Earth.
I gave you unique data insights,
I gave you a clear vision.
Creating Sustainable economic development,
I enable high quality of life.
I help you to become a smart citizen,
By streamlining the data and, accelerating business.
I reduce the digital divide,
Empower humanity.
Together we ignite,
We integrate.
I am Geospatial
The facilitator
Your process foundation,
For a better future.
I am the 'digital trail'.

ANSWERS

QUIZ ON GEOSPATIAL TECHNOLOGY

1 B. Geographic Information System
2 C. 1963
3 A. Father of GIS
4 C. WIKI(Well-informed Kinetic Information)
5 C. 1832
6 A. Charles Picquet
7 C. Cholera
8 A. Heat map
9 B. San Francisco, USA
10 A. Urban and Regional Information Systems Association
11 D. Triangulated Irregular Network
12 B. Spatial Data Infrastructure
13 A. Database Management Software
14 C. WIKI(Well-informed Kinetic Information)
15 B. 2025
16 A. Light detection and ranging
17 A. Radar
18 D. 4
19 B. Des Plaines, Illinois
20 D. Fra Mauro

WORD HUNT

1 ARYABHATTA
2 SPUTNIK
3 ROGER
4 TRITON
5 STUDSAT
6 ASAT
7 ASTROSAT
8 OBERON
9 US
10 GOOGLE MAP

POSTERS

LET YOUR CREATIVITY SHINE

BY- KOMAL

DO YOU KNOW?

In 1968, APOLLO-8 returned the first picture of earth from deep space

BY-PAVI BENIWAL

DO YOU KNOW?

Neil Armstrong & Buzz Aldrin became the first humans to walk on the moon.

"THE ONE WITH COVID & TECHNOLOGY"

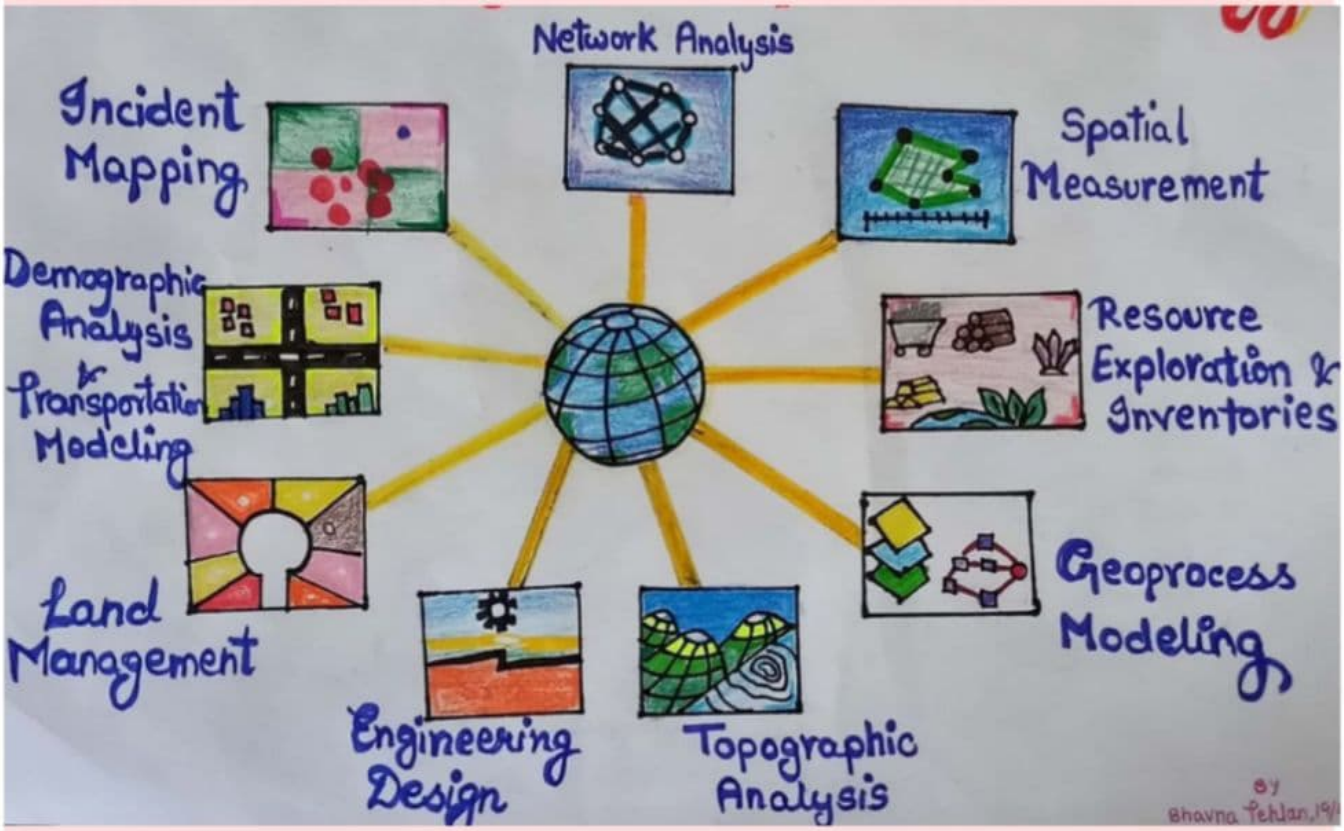
BY- RAUNAK SAHNI

BY-HARSHITA RAO

DID YOU KNOW?

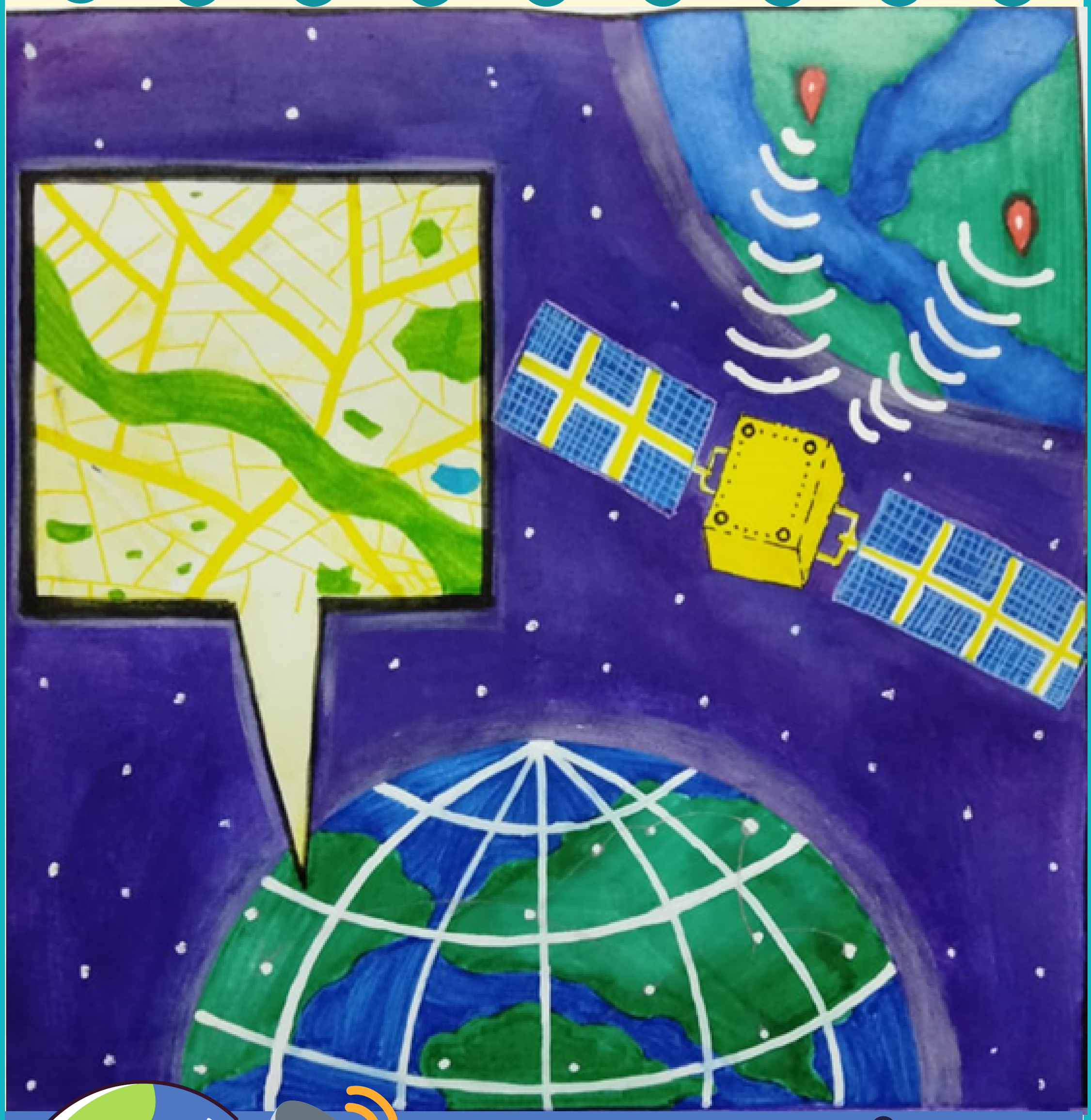
-The collection of data from space was started with orbiting US meteorological satellite.

APPLICATION OF GEO-SPATIAL TECHNOLOGY



BY - BHAWNA

BY-ARUSHI SAPRA



GEO SPATIAL TECHNOLOGY

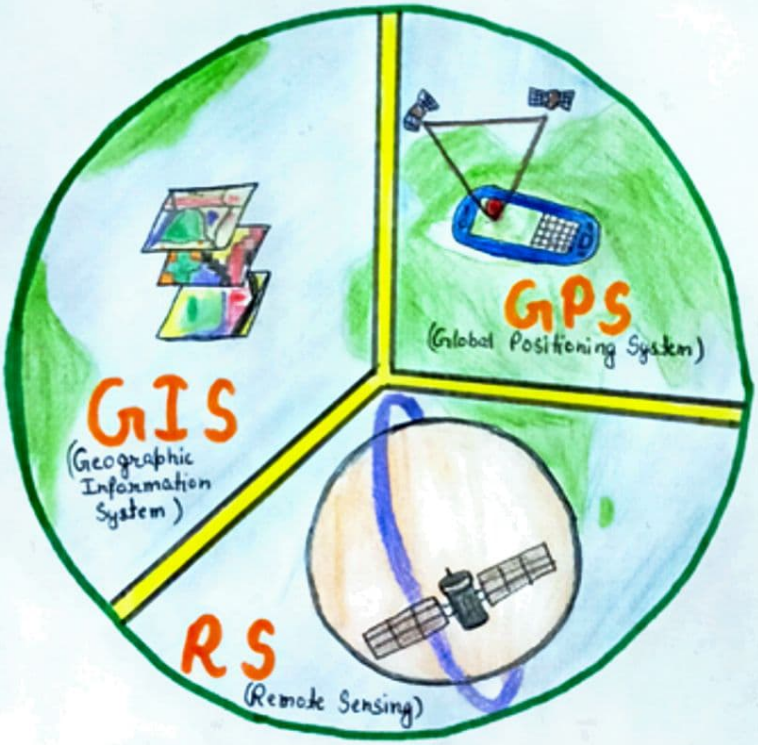
FACT CHECK

THE FIRST SPACE STATION IN HISTORY WAS DEVELOPED IN RUSSIA KNOWN AS “RUSSIAN SALYUT - 1”

DISCOVER THE WORLD THROUGH

GEOSPATIAL TECHNOLOGY

MAP YOUR FUTURE



A KEY TO SMART LIFE

SMART CITIES

SMART WORLD

TAMANNA

BY- TAMANNA

GEOSPATIAL : INTERACTIONS

WHERE GEOGRAPHY MEETS TECHNOLOGY

By- Muskan

FUN FACT

Ozone depletion over Antarctica was noted by British scientists Joe Farman, Brian Gardiner and Jonathan Shanklin by satellites.

Congratulations

NAZNEEN SULTANA

Topped University Of Delhi in 2nd Year

By Scoring 9.46 CGPA(89.87%)

Thank you for making our department proud

May success and prosperity follow to you wherever ya go and whatever you do

Congrats, toppers

NAZNEEN SULTANA

9.46 CGPA

ASTHA BHARTI

9.36 CGPA

MUSKAN RAJPUT

9.36 CGPA

PRAKSHI RANA

9.36 CGPA

BATCH 2018-2021

THE VERY FIRST BATCH OF OUR DEPARTMENT OF GEOGRAPHY

Congratulations To 1st year toppers(2019-20)

1st Rank

Rima

9.23 CGPA

2nd Rank

Priyanka

8.91 CGPA

3rd Rank

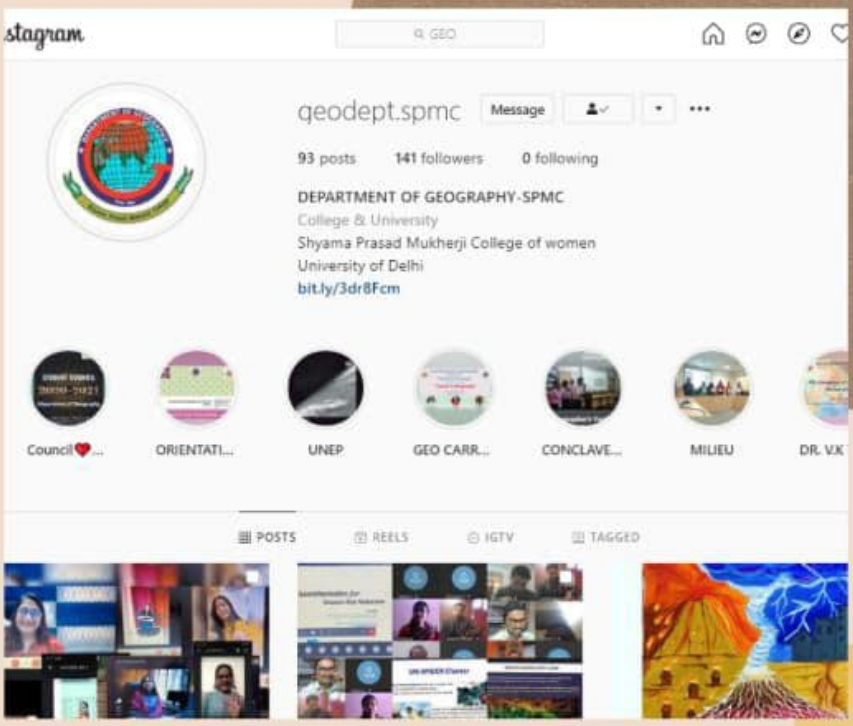
Aastha

8.91 CGPA

Your dedication towards work is really inspiring. Wish you many years of achievement of your goal and success

PSST

ARE YOU FOLLOWING US ON INSTAGRAM YET?



FOLLOW - GEODEPT.SPMC

HERE'S THANKING

PRINCIPAL MA'AM : Prof. Sadhna Sharma

HEAD OF THE DEPARTMENT : Dr. Rachna Dua

FACULTY MEMBERS: Ms. Anuradha Shankar, Dr. Gargi Kar Majumdar, Mr. Aakash Upadhyay, Ms. Maansi Malik, Md. Arif, Mr. Ankur Srivastava, Mr. Prem Prakash and Mr. Shashank Singh

FACULTY ADVISOR: Ms. Anuradha Shankar
Dr. Gargi Kar Majumdar


ON BEHALF OF THE ENTIRE TEAM, WE WOULD LIKE TO TAKE A MOMENT TO WISH A VERY HEARTFELT
THANK YOU
DEPARTMENT OF GEOGRAPHY
Shyama Prasad Mukherji College
Our deepest gratitude and appreciation to all those who helped us fulfill our mission by delivering the message that each of us have a voice and the power to make a difference