

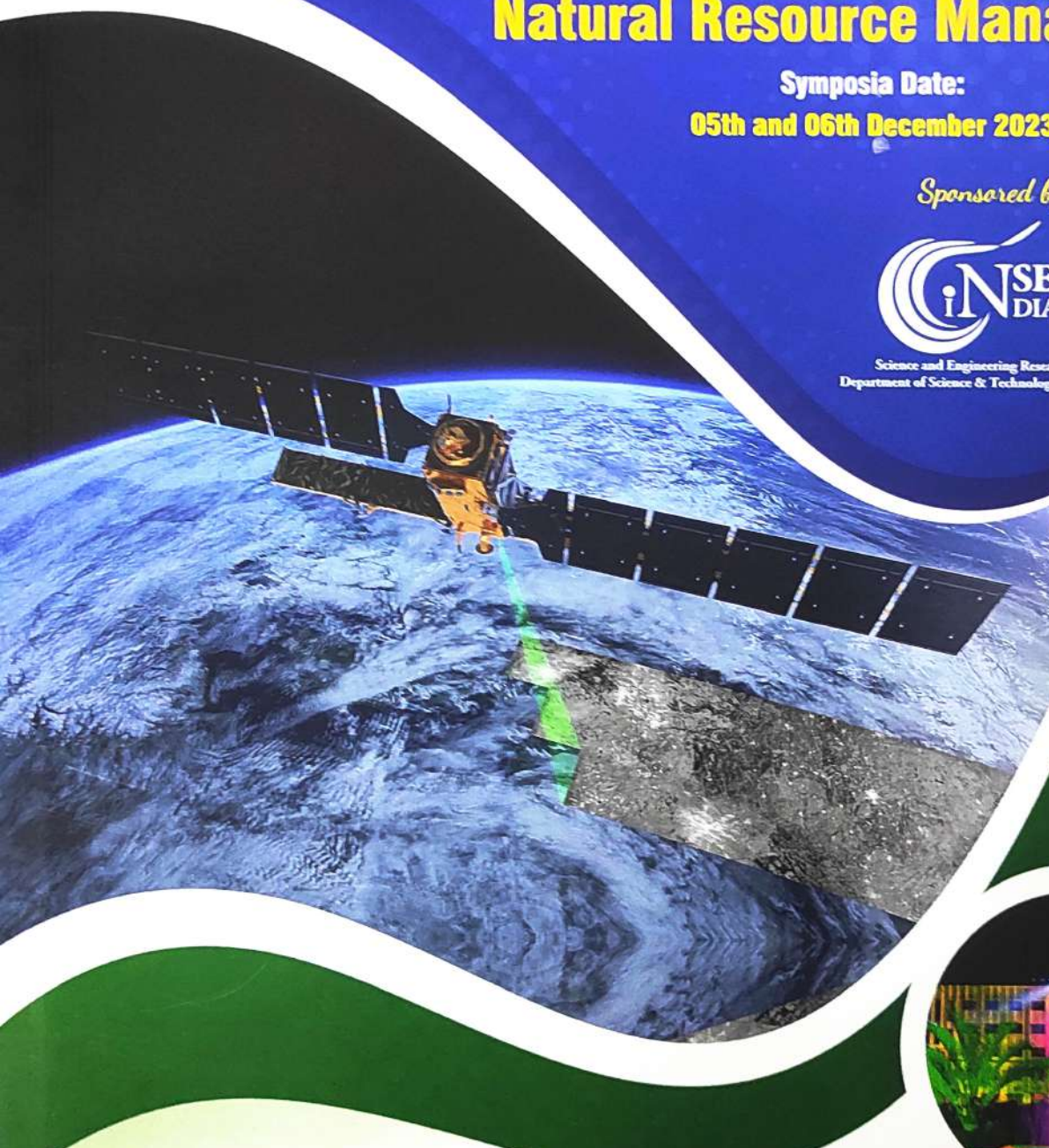
**SERB Sponsored
Two Days National Symposia
on
Application of Geospatial Science for
Natural Resource Management**

**Symposia Date:
05th and 06th December 2023**

Sponsored by



Science and Engineering Research Board
Department of Science & Technology, Govt. of India



Organised by



MIDNAPORE CITY COLLEGE

(Recognised by UGC, Govt. of India & Affiliated to Vidyasagar University and West Bengal University of Health Sciences)

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on
"Application of Geospatial Science
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SOUVENIR

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Date:- 30/11/23

To
The Director,
Midnapur City College ,
Paschim Mednapur .

Subject: Heartfelt Gratitude for the Honor of Guest Speaker at the Geospatial Science Seminar.
Ref Memo No :- MCC/SEMR-GEO/1123-8698(I) Dated :- 27th Nov 2023

Sir,

I am writing to express my sincere gratitude for the honour bestowed upon me by inviting me as the honoured guest at the recent seminar on "Applications of Geospatial Science for Natural Resource Management." It was truly a privilege to be a part of such a thought-provoking and insightful event.

I would like to extend my thanks to the entire Medinipur City College community, especially the organizers and faculty members, for their warm welcome and hospitality. The enthusiasm and engagement of the students made the seminar a dynamic and enriching experience.

The opportunity to share my insights on geospatial science and its applications for natural resource management was truly rewarding. I commend the college for its commitment to providing students with exposure to cutting-edge topics and fostering an environment that encourages intellectual curiosity.

It was inspiring to witness the passion and curiosity of the students, and I believe that their active participation will undoubtedly contribute to the future of geospatial science and its role in addressing environmental challenges.

Once again, I extend my heartfelt thanks for this wonderful opportunity. I look forward to future collaborations and remain at your disposal for any further engagements.

Warm regards,


Roman Mandal
Block Development Officer
Salboni Development Block

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ABOUT THE COLLEGE

MIDNAPORE CITY COLLEGE, the first self-financing General Degree College in the South Bengal region within the state of West Bengal, has been established by MORAIN HUMAN RESOURCE DEVELOPMENT ORGANISATION, a registered society bearing registration S/IL/31682 on dated 02.09.2005 having its office at Aparnapalli, Satbankura, Paschim Medinipur with the sole aim to help the people as per notification of Higher Education Department, Govt. of West Bengal bearing No: W.B (Part-I)/2015/SAR-458 dated 23rd day of September, 2015 published in Kolkata Gazette and subsequent No Objection was issued to this college through the order No.197-ILC/OM-58L/2017 dated 18.07.2017 on the basis of which Vidyasagar University also extended the affiliation by its memo No: VU/R/ Circular /8EC-10/ C0383/ 2017 dated 05.09.2017 and VU/IC/BMLT/MCC/017/2019 dated 29.01.2019. The college is also recognized under section 2(f) by UGC, Govt. of India bearing File No: 8-1/2018(CPP-I/C) dated 18.01.2018 for conducting different Under Graduate and Post Graduate programmes in the faculty of Arts and Science and Allied Health Science from the academic session 2017-18. The college is located at educationally backward and rural area in the district of Paschim Medinipur within the state of West Bengal and most of our students belong to socially and economically backward sections of society. The sole aim of MORAIN HUMAN RESOURCE DEVELOPMENT ORGANISATION is to serve people by imparting quality education and research to the society. The institution has received recognition from Department of Scientific Industrial Research (DSIR) Govt. of India as Scientific and Industrial Research Organisation (SIRO) bearing F. No.11/762/2018-TU-V dated 26th November,2018. The institute is recognised under The Directorate of Medical Education, Government of West Bengal (ME/MISC-85-2020/M/1720/1(2) dated 13.11.2020, ME/MISC-85-2020/M/2018/1(2) dated 30.12.2020, ME/MISC-85-2020/M/167/1(2) dated 20.01.2021, ME/MISC-85-2020/M/168/1(2) dated 20.01.2021, ME/MISC-85-2020/M/169/1(2) dated 20.01.2021, ME/MISC-85-2020/M/170/1(2) dated 20.01.2021) and it is affiliated to The West Bengal University of Health Sciences, West Bengal (OG/WBUHS/2020-21/1328 dated 25.01.2021, OG/WBUHS/2020-21/1672, OG/WBUHS/2020-21/1673, OG/WBUHS/2020-21/1674, OG/WBUHS/2020-21/1675 dated 23.03.2021). The institute believes that excellent teaching can produce better students and thereby helping the institute to emerge as a centre of excellence.

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Message from the Director

MIDNAPORE CITY COLLEGE



It is my immense pleasure to welcome you all to the SERB sponsored National Symposia of Midnapore City College on **Application of Geospatial Science for Natural Resource Management**. This symposium provides an opportunity for the meeting of Scientists, Professors, Researchers, Students, and specialists in the various research and development fields of Applied Sciences specifically Geography and Geospatial Science.

Midnapore City College is committed to providing holistic education to develop individuals with integrity, emotional and mental harmony, physical capability, social awareness as well as participation in cultural activities to become upright citizens of the nation. The college has maintained its academic standard as evident in the results and placements of the students in reputed sectors like education, health, and administration.

I hope eminent speakers of this symposium will cover the theme on Application of Geospatial Science for Natural Resource Management from different perspectives. I believe that this symposium will penlight the challenges on Natural Resource Management and definitely find the possible solutions. I am also thankful to the supporting organizations and sponsoring agencies which have provided support to this Symposium financially and technically, in spite of the present economic scenario.

I wish for the grand success of the Symposia.

Dr. Pradip Ghosh
Director
Midnapore City College

**SERB funded Two days National level Symposia on Application of
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Message from the Principal

MIDNAPORE CITY COLLEGE



Good morning and welcome to SERB sponsored two days National Symposium on “**Application of Geospatial Science for Natural Resource Management**”. The college has been functioning with a noble vision and mission clearly reflecting its social responsibility and commitment to nation building. The institution provides effective and efficient support and facilities to academic mission and maintains a supportive environment for all students and staff by this symposium held in the rural area of Midnapore (Jungalmahal).

This is a marvellous opportunity for me to show my support for this symposium. This national symposium is an unprecedented gathering of students, researchers and scientists. It is a chance for us to discuss the "Bridges between Geospatial Science and Resource Management". This Symposium aims to bring together leading academic personalities including students and research scholars to exchange and share their experiences and researches about the scientific research work done in different disciplines related to pure and applied science. It also provides the premier interdisciplinary forum for researchers and educators to present and discuss the most recent innovations and trends in bioinformatics research and practical challenges and the solutions adopted in the field of Geospatial Science.

It is my hope that the Conference will stimulate a thoughtful dialogue. We will all be benefitted with the healthy exchange of ideas. I hope these discussions will reinforce our strong commitment.

Thank you. Best wishes.

Dr. Sudipta Chakrabarti

Principal

Midnapore City College

**SERB funded Two days National level Symposia on Application of
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Message from Vice-principal

MIDNAPORE CITY COLLEGE



It is a matter of great pleasure for me to welcome you all to the SERB sponsored National Symposia of Midnapore City College on **Application of Geospatial Science for Natural Resource Management**. This symposium aims to provide a complete portrait about the possible role, challenges, and issues of the Geospatial Science. Renowned speakers and the most recent techniques, developments, the newest updates in Geospatial Science are hallmarks of this symposia. This symposia gives multi-disciplinary platform for scientists, researchers, educators, young researchers, and students to give and discuss the most recent innovations regarding Application of Geospatial Science.

We welcome you all to Midnapore City College and hope that this Symposia will act as a medium for all of us present here to ponder upon the topic of discussion, challenge us to strive towards it and inspire us at the same time. Thank you!

Dr. Kuntal Ghosh

Vice-principal

MIDNAPORE CITY COLLEGE

**SERB funded Two days National level Symposia on Application of
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Message from Convener



I graciously welcome the participants of two days National Symposium on “**Application of Geospatial Science for Natural Resource Management**” on 5th-6th December, 2023 sponsored by Science and Engineering Research Board (SERB), Govt. of India. The main goal of organizing this Symposium is to share and enhance the knowledge of each and every individual in the Geoinformatics world.

The integration of Geospatial Science with Informatics provides better way of all kind planning and management. Geospatial Science can provide a powerful framework for supporting the adaptivity of planning systems which are customized to the specifics of the space technology. The main objectives of this Symposium are (a) To know about the basic application of **Geospatial Science for Natural Resource Management** including land, water and agricultural resource, characteristics, and features, (b) To educate the researchers and students about the Geospatial Science, (c) To learn more on challenges, emerging trends as well as issues of proposed and possible Informatics in present scenario. Furthermore, this Symposium will also facilitate the participants to expose and share various novel ideas. I am sure the technical and scientific program of the symposium would certainly give the delegates an opportunity for fruitful discussions and stimulating interactions. You will get ample opportunities to widen your knowledge and network. Such a large symposium event is the culmination of many individuals. I would like to thank Dr. Pradip Ghosh, Founder Director of Midnapore City College for his encouragement, guidance & providing a stimulating environment for such educational developments. I would like to thank the conference committee for extending their valuable time in organizing the program and all the authors, reviewers, and other contributors for their sparkling efforts and their belief in the excellence of two days National Symposium. I would like to extend my best wishes for the success of the conference in achieving its objectives.

Dr. Kartic Bera

Convener and Assistant Professor in Geography
Department of Pure and Applied Science, MIDNAPORE CITY COLLEGE

Keynote Speech

Application of Artificial Intelligence and Machine Learning for Natural Resources management with reference to Agriculture

Prof. Pabitra Banik

Professor, Agriculture and Ecological Research Unit, Indian Statistical Institute, 203,
Barrackpore Trunk Road, Kolkata, West Bengal India

In the era of rapid environmental change, the integration of Artificial Intelligence (AI) and Machine Learning (ML) into natural resource management has emerged as a game-changer. This presentation navigates through the innovative applications and transformative potential of AI and ML in optimizing ecological systems and promoting sustainable resource utilization.

Our research explores the intersection of environmental science and cutting-edge technologies, emphasizing the capacity of AI and ML to revolutionize data analysis, modeling, and decision-making processes. Through the incorporation of advanced algorithms, we demonstrate how these technologies can effectively predict and manage natural resource dynamics, enabling a paradigm shift from traditional methods to more precise and adaptive strategies.

The paper delves into specific use cases, showcasing successful implementations of AI and ML in biodiversity monitoring, water resource allocation, and land-use planning. We highlight the efficiency gains, cost-effectiveness, and scalability achieved through the automation of data processing, pattern recognition, and real-time monitoring, providing tangible examples of improved resource conservation outcomes.

Furthermore, we address the inherent challenges and ethical considerations associated with AI and ML deployment in environmental research. By presenting a balanced perspective, we underscore the importance of responsible and transparent practices to ensure the ethical use of technology in natural resource management.

The audience will gain insights into the practical implications of adopting AI and ML, fostering a dialogue on potential collaborations between environmental scientists, data analysts, and policymakers. Ultimately, this presentation aims to inspire researchers to embrace the opportunities presented by smart ecology, advocating for a future where technology plays a pivotal role in preserving our planet's precious natural resources.

Lead Lecture (s)

**EVALUATING RESOURCES OF MANGROVE ECOSYSTEM USING
GEOSPATIAL TECHNIQUE: A CASE STUDY FROM ODISHA COAST**

Professor. Kakoli Banerjee*

Department of Biodiversity & Conservation of Natural Resources, Central University of
Odisha,

Sunabeda, P.O. NAD, Koraput 763004

*Email: banerjee.kakoli@yahoo.com; Phone: +91-9439185655

Abstract:

Mangrove forest contributes significantly to the global carbon cycle (blue carbon) through the process of photosynthesis. They contribute 10% of total net primary productivity (NPP) and 25% of carbon burial in the global coastal zone. Mangrove sediment properties are valuable parameters influencing the floral assemblage of the mangrove community. A sound physical and chemical quality of water and sediment ensures good health of the mangrove forest. The physical, chemical and biological properties of sediment in mangrove forest differs widely w.r.t different forest sites, which is a result of various intricate interactions between biotic and abiotic factors. On this background, the present research programme aims to study the carbon sequestration potential of selected mangrove species (tha⁻¹) (*Avicennia marina*, *Avicennia officinalis*, *Excoecaria agallocha*, *Xylocarpus granatum* and *Rhizophora mucronata*) with its floral associates. The total carbon (TC) calculated from the study area amounts to 64,795,648 tC which equals to 64.80 TgC of carbon dioxide equivalent (CO₂e). The study recommends for appropriate management strategies for conservation of mangroves based upon substratum characteristics.

Keywords: Mangrove diversity, blue carbon, water quality, sediment quality, mangrove loss

Water Resource Scarcity and Management in the context of Climate Change:

Role of Geospatial Technology

Professor Ramkrishna Maiti

Vidyasagar University, Midnapore 721102

Abstract:

Availability of water at any place is constrained by numbers of natural hydrological factors which include less abundance, spatial and temporal inequality in distribution, topographic factors and location within basin. Presently global climate change alters the general circulation pattern and brings large regions of both the hemispheres into water deficiency. IPCC (2013) estimate shows that two-third of world population suffers from acute water scarcity. Drought frequency in India as well as in world-scale is increased recently. In this circumstances, efficient water management is the pre-requisite for sustainable development and for which basin wise water budgeting is essential. Geospatial technology plays important roles in this context. SWAT seems to be very effective in basin wise hydrological analysis. Presently, ANN and Decision Trees are also applied in basin scale hydrological modelling.

Key Words: Water scarcity, Climate change, Geospatial technology

**Geospatial Science in Disaster Management: Fostering Sustainable Natural Resource
Management**

Dr. Kiran Jalem

Assistant Professor, Department of Geoinformatics, Central University of Jharkhand, Ranchi
(Jharkhand, India), kiran.jalem@cuja.ac.in

Abstract:

The intersection of natural resource management with emergency planning and response has come to rely heavily on geospatial science. The present abstract delves into the function and importance of geospatial technology in supporting natural resource management techniques that are robust to disasters. By offering crucial insights into the dynamics, vulnerabilities, and resilience of natural resources to disasters, remote sensing and GIS technologies have completely changed the way that natural resource monitoring and evaluation are carried out. With the use of these technologies, it is possible to identify crucial regions such as forests, watersheds, and hotspots for biodiversity which facilitates the development of focused conservation plans and proactive risk assessments. The importance of geographic science in disaster management for natural resources is emphasized by lessons learned from previous tragedies. Assessing the effects of disasters on ecosystems is made easier by real-time data collecting, geographical analysis, and modelling, which also allows for quick action. In the field of disaster management, geographic science is vital because it is paving the way for sustainable resource management in the face of growing environmental uncertainty. By utilizing state-of-the-art technology and analytical techniques, geospatial science plays a crucial role in proactive planning for disasters, efficient response to them, and the subsequent restoration of impacted ecosystems. Geospatial science has become a crucial aspect of disaster management, offering valuable insights and lessons for improving preparedness, response, and recovery strategies. The evolution of geospatial technology has enabled the collection, analysis, and dissemination of real-time data, mapping affected areas, and analyzing disaster dynamics with precision. This has been facilitated by remote sensing techniques, Geographic Information Systems (GIS), and Global Navigation Satellite Systems (GNSS). Geospatial technologies provide a useful perspective for evaluating risks in natural resource systems through the coordination of detailed spatial investigations and predictive modelling. Decision-makers are enabled to strategically allocate resources and fortify ecosystems against possible disasters by means of the identification of high-risk zones and the dynamic mapping of environmental elements.

Keywords: GIS, GNSS, predictive modelling.

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GEOSPATIAL APPLICATIONS IN LAND RESOURCES

Spatiotemporal Analysis of Land Use and Land Cover Dynamics using Multi-Temporal Remote Sensed Imagery and Quantifying Landscape Fragmentation: A Case Study of Chandannagar Municipal Corporation (CMC), West Bengal, India

Tuhin Pal¹, Trishita Podder² and Dr. Atreya Paul³

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²*B.Sc. Geography, Bijoy Krishna Girls College, Pursuing M.Sc. Geography, Calcutta
University*

³*Associate Professor Chandernagore College, West Bengal Education Service*

Abstract

The rapid population growth in developing countries has resulted in increasing pressure on land resources in both urban and rural areas (*Briassoulis, 2000*). The growth of urban population has been one of the major driving forces of change in the urban environment, leading to the development of suburban areas. This has resulted in the loss of other land uses, such as agricultural land and forests at the urban fringes, which has reduced the availability of ecosystem services (*Dale et al., 1998*). Land use/ Land cover (LULC) dynamics and landscape fragmentation are critical aspects of studying the complex interactions between human activities and the environment (*Anderson et al., 1976*). This study focuses on Chandannagar Municipal Corporation, characterized by diverse land uses due to its abundant agricultural resources, rapid urbanization. Employing Remote Sensing and Geographic Information System (GIS) techniques, we analyse multi-temporal satellite imagery and land cover data. Through LULC change detection analysis, we identify and quantify spatial and temporal patterns of land use transformation. Landscape metrics are employed to evaluate fragmentation, offering quantitative insights into the spatial arrangement and connectivity of various land cover types. The findings of this research provide valuable insights into LULC dynamics and landscape fragmentation in Chandannagar Municipal Corporation. The results highlight the extent and rate of land use changes, including the conversion of agricultural lands, expansion of urban areas, and changes in vegetation cover. The assessment of landscape fragmentation reveals the degree of spatial heterogeneity and connectivity within the landscape, indicating areas of high fragmentation and potential ecological consequences. The outcomes of this research contribute to the existing knowledge base on land use planning, resource management, and sustainable development in Chandannagar.

Keywords: Land use/cover dynamics, change detection, built-up area, spatio-temporal analysis, spatial metrics, Landscape Fragmentation

Heritage and Ecological Tourism in West Sikkim: A Sustainable Exploration

Mayurmi Dolui¹, Dr. Amartya Pani²

¹PG Student Dept. of Geography, Midnapore City College

²Assistant Professor, Pure and Applied Sciences (Geography), Midnapore City College

Abstract:

The multifaceted realm of heritage and ecological tourism in the enchanting region of West Sikkim, India. Nestled in the eastern Himalayas, West Sikkim boasts a rich cultural tapestry, diverse ecosystems, and a commitment to sustainable tourism practices. The paper examines the interplay between heritage preservation and ecological conservation, emphasizing the pivotal role of responsible tourism in maintaining the delicate balance between cultural legacy and environmental integrity. The heritage aspect of West Sikkim lies in its ancient monasteries, traditional architecture, and indigenous practices that reflect the amalgamation of Tibetan, Nepalese, and indigenous Sikkimese cultures. The study explores the efforts made by local communities and authorities to safeguard these cultural treasures while ensuring their accessibility to tourists. It also discusses the significance of community engagement and empowerment in preserving and promoting the unique heritage of the region. On the ecological front, West Sikkim unfolds as a biodiversity hotspot, featuring lush forests, alpine meadows, and diverse wildlife. The paper scrutinizes the implementation of eco-friendly tourism initiatives aimed at minimizing the environmental impact of visitor activities. It highlights the role of conservation programs, sustainable trekking routes, and wildlife protection measures in maintaining the ecological equilibrium. Furthermore, the study examines the economic benefits derived from heritage and ecological tourism in West Sikkim. It sheds light on the potential for community-based tourism initiatives to uplift local economies while fostering a sense of pride and responsibility among residents. The synthesis of heritage and ecological elements in West Sikkim's tourism model serves as a case study for sustainable practices applicable to other regions facing similar challenges. The findings underscore the importance of a holistic approach that considers cultural preservation, environmental conservation, and community involvement to ensure the longevity of West Sikkim's allure as a destination for mindful and sustainable tourism.

Keyword: Heritage, ecological, tourism, sustainable, community-based tourism, heritage preservation, West Sikkim

A Study on Spatial Land Distribution for Agricultural Uses and their return from Cultivation in Different Agro-Climatic Zone in West Bengal

Sridev Adak

Ph. D. Research Scholar, Department of Rural Studies (PCK), Visva-Bharati, Sriniketan, PIN-731236, Contact: Phone- 8001555056, email- sridevadak94@gmail.com

Abstract:

The agricultural sector in the state of West Bengal is strengthening the livelihood-supporting sector and significantly contributing to the state economy. Land, the main productive asset to the farmers' households that provides the opportunity of the sources of income, is mainly characterised by various natural, climatical, and human factors. With the help of micro-level data of NNSO 77th round of Situational Assessment Survey of Agricultural Household, 2019, an effort has been made to study the spatial distribution of agricultural land holding and their return from agricultural activities in different agro-climatic zones in the state of West Bengal.

The result of the descriptive study shows that the average operational land holding for cultivation in the state is very low, and comparing the different agro-climatic zones, it is found lowest in the Coastal Saline zone (1.95 acres) and highest in Vindhyan Alluvial (3.47 acres). As per the size of land holding, it is found that the marginal and small land holding farmers are comparatively high in Northern Hill and Coastal Saline zones among the different agro-climatic zones. To estimate the return from cultivation, the study calculated the input-output ratio per acre, i.e., the output per rupees of input per acre, and it is found highest at 1.83 in the agro-climatic zone of Northern Hill compared to lowest at 1.33 in Undulating Red and Laterite zone. In conclusion, the study emphasized that the spatial distribution of operational land holding by the farmers significantly varies among the different agro-climatic zones along with the return from cultivation. Though there is a positive causal relation of land holding with return from cultivation per hectare, there are various other factors that determine the return from cultivation.

Key Word: Agro-Climatic Zone, Spatial Land Distribution, Input-Output Ratio, West Bengal

**Landuse and Land Cover Change for Urbanization and Infrastructural Development:
Micro Level Study of Tarakeswar Municipality in West Bengal**

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Abstracts:

Urbanization is a process of increase of modernization system which changes the socio economic activities and quality of life according to the time frame. It is the result of social, economic and political advancement that lead to urban concentration and emergence of large cities, change in land use and transformation of pattern of organization and governance from rustic to metropolitan system. The changes of land use land cover are a common fact in the urban area at present. Land use in urban environment is more dynamic comparatively to rural area. The increasing urban population trend and urban sprawl, induced changes of land use and land cover in rural and urban areas, finally makes a long run impact on social environment and economy as well.

Hugli district is traditionally well known as one of the most prosperous agricultural regions of West Bengal, but nowadays district is experiencing rapid urban extension and infrastructural development towards productive agricultural land since 1991. Such changes in land use make a threat to rural economy and sustainable livelihood structure of the society. It has also been noted that such modification in rural areas are interrelated with the livelihood structure of urban areas also. This research endeavor mainly focused on the spatio-temporal changes of land use due to over urbanization and infrastructural development and its impact on rural and urban livelihood structure in parts of Hooghly district with GIS mapping and Statistical techniques.

Keywords: Urbanization, Urban concentration, Urban sprawl, Urban extension, Sustainable livelihood

Spatiotemporal Analysis of Rural Infrastructure and Agricultural Development in India

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Abstract:

In India, agriculture continues to provide livelihood for more than half of the population. The self-sufficiency in food production after green revolution was built with government support by the creation of a network of institutional support structures in rural areas and with time this has transformed Indian agriculture. This paper focuses on agricultural performance of India on socio-temporal scale based on rural infrastructure development over the years. The data has been collected from various reports and several government offices dealing with agricultural sector of India. The data has been presented and analyzed through various statistical measures like Composite index of rural infrastructure, infrastructure index method, least square method, Pearson correlation method, Matrix table method, Normal classification method along with choropleth mapping technique to show spatial variation over different states in India. Analysis in the change in the indicators (Road density, Gross irrigated area as % of total cropped area, Consumption of electricity in rural sectors as % of total Supply) of rural infrastructure in India shows near about a constant development of above-mentioned infrastructural components in India. Examining the relationship between the composite index of physical indicators of rural infrastructure and agricultural productivity in India on temporal scale makes it clear that distribution of rural infrastructure influences agricultural productivity. Examining the relationship on spatial scale shows major variations over different states. In India, agricultural performance has transformed over the years; starting from pre green revolution period (1951) through the initial period of green revolution (1961), maturing period of green revolution (1971), matured period of green revolution (1981), during and post liberalisation period (1991), post National Agricultural Policy (2001) to recent period (2011). Similarly changes in rural infrastructure have also occurred along with the changes in pattern of investment both in public and private sectors. This paper aims to analyse the relationship between rural infrastructure (considering only the physical indicators) and agricultural performance in India on temporal scale as well as represent its state wise variation in liberalisation and post liberalisation era i.e. from 1991 to 2011.

Keywords- green revolution, National Agricultural Policy, rural infrastructure, agricultural productivity.

Land use /Land cover change identification for Environmental Impact assessment of Dryland area, West Bengal

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Abstract:

Land is a basic natural resource of every human settlement and the nation as a whole. It is the basis of primary economic activity and formed as prime resource to the peasant community. The available agricultural land resources exercise a lasting effect on the socio- economic development of a farmer and the region as a whole. To put it in a nutshell, land resources play a significant role in determining man as economic, social and cultural progress. Despite recent achievement and progress in our economy, Land use change remains one of the important problems in developing country like India. There is no standard definition for land use change, but in this long term process, where human activity plays a vital role. The present study district Jhargram is an economically backward with a huge forest cover of 3037.642 Km. (Census-2011). The rural (96.52%) poor, mainly reserve category people are associated and dependent on its forest cover for various purposes. During the last few decades (1971 to 2011), it is observed that 11.31% of forest cover of the district is degraded. The district has a high population growth rate with a noticeable population density of 370 persons/ Sq Km. (2011 Census). As the work participation rate of the district is very low (42.6%), poor people nearer to the forest are much more dependent on forest for food, fuel, furniture, fertilizer and medicinal purpose. The present paper aims to review the condition of forest degradation in Jhargram district. There is a high need to understand the consequences of deforestation on human being as well as the environment. Forest degradation or deforestation has a massive impact on climate change, which plays a key role to leads the many natural calamities like droughts, floods, severe cyclones etc. So, to protect the hydrological cycle, climate, soil and biodiversity, we need to protect the forest first. Therefore, in the present paper, an exploratory analysis is attempt based on some descriptive and quantitative methods, like review of literature work, cartograms representation and statistical applications and GIS techniques. The present attempt is also aiming to find out some possible way out to protect the forest cover and reestablish the global awareness among the local to protect the forest.

Keywords- Land use change, socio- economic development, Forest degradation, GIS techniques

Assessment of Soil Organic Carbon and its Mapping using Integrated Satellite- derived Vegetation Indices and Regression Models

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Abstract:

Soil organic carbon (SOC) is a crucial property of soil that significantly influences both forest and agricultural ecosystems. Our research took a comprehensive approach, integrating satellite data, laboratory experiments, and on-site observations to develop digital maps of soil organic carbon (DMSOC) for Dulung Watershed of West Bengal. We gathered 60 soil samples randomly from five untouched surface soil cores, ranging from 0 to 15 cm deep, to establish and validate our dataset. In our prediction of DMSOC, we utilized vegetation indices derived from remote sensing (RS) data, which included NDVI, MNLI, MSAVI, and RDVI alongside actual measurements of SOC from the field. We employed both linear and multivariate regression (MR) models to make predictions. We established statistical relationships between vegetation indices and observed SOC levels. These relationships were then used to forecast SOC using the R software. Our results indicated higher SOC concentrations in densely forested areas and vegetated lands. Notably, the MR model, combining RS data with field observations, exhibited superior performance, showing a higher R-squared value is 0.72 and a lower root mean square error is 0.20 compared to models relying solely on vegetation indices. This study highlights the effectiveness of satellite- derived vegetation indices as robust predictors of SOC, especially in Dulung Watershed within tropical and sub-tropical regions. Consequently, our research presents a promising approach to enhance the efficiency and precision of digital soil organic carbon mapping.

Keywords: Satellite Images; NDVI; Multivariate regression models; Digital soil organic carbon

GEOSPATIAL APPLICATIONS IN WATER RESOURCES

GIS Applications in Preserving Water Today for Nurturing Green Tomorrows: A Sustainable Approach

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Abstract:

In the face of escalating global water challenges and the imperative to foster environmentally sustainable practices, this study investigates the role of Geographic Information Systems (GIS) in water preservation and its impact on shaping a green future. Water scarcity is a pressing issue, demanding innovative solutions that balance current needs with the imperative to safeguard resources for future generations. This research explores the application of GIS as a strategic tool for preserving water resources. The study integrates spatial analysis, hydrological modeling, and sustainable development principles to develop a comprehensive approach to water conservation. By leveraging GIS technology, the research aims to optimize water usage, identify areas vulnerable to scarcity, and design sustainable strategies that consider both ecological and human needs. The GIS application presented herein incorporates real-time data, satellite imagery, and advanced spatial analytics to monitor water usage patterns, assess the health of aquatic ecosystems, and guide conservation efforts. The study emphasizes the importance of community engagement and collaboration, demonstrating how GIS can facilitate data-driven decision-making and enhance public awareness for sustainable water practices. By examining the intersection of GIS technology and water conservation, this research contributes to the growing body of knowledge on sustainable resource management. The findings underscore the potential of GIS to be a catalyst for change, promoting a harmonious coexistence between human activities and the natural environment. The study concludes with practical insights and recommendations for policymakers, water managers, and communities to adopt GIS applications in their endeavours toward preserving water today and nurturing green tomorrows.

Keywords- GIS, Scarcity, Awareness, Management.

**Geospatial Analysis for Water Resource Management of Jharagram District,
West Bengal**

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Abstract:

Water is a precious asset of humanity forever. Water requirement for domestic, agricultural and agro-industrial is met mainly by the subsurface water resources. Due to dynamic climatic conditions the region's water table is showing a declining trend and backward people (socially) are affected daily. Keeping in view this dictum the present study has been carried out pertaining to the West Bengal dry land area. This region is situated under Choto Nagpur Plato region and is a semi-arid region. This study is based on data and limited field check to identify the most suitable site for the planning of rainwater harvesting structures in, mainly to surface water utilization and increase the ground water resources for sustainable development. Determination of Rainwater Harvesting (RWH) potential sites study uses various thematic layers such as rainfall, slope, land cover/ land use, geology, drainage density, hydrologic soil group, lithology and socio-economic activity. All these layers were prepared with the help of images and numeric data and integrated using weighted overlay techniques in a GIS environment to derive suitable sites for soil and water conservation structures. Based on site suitability results and topographic characteristics, locations for conservation structures select some check dams, tanks, Ponds for implementing soil and water conservation structures. These locations are ecologically sound and economically viable. This will sustain the productivity of surface water utilization and increase the groundwater resources for the future in and around Bengal's dry-land area. The outcome of this study may be replicated in a somewhat similar terrain condition for sustainable development.

Keywords- Subsurface, RWH, Implementing, Structure.

Multi-criteria based sub-basin Prioritization of Damodar sub-basin of West Bengal using Geospatial Techniques and Analytical Hierarchy Process (AHP) for susceptibility to Soil Erosion

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Abstract:

The dire need for water as an important resource, calls for its management. Managing the water of a common draining area of runoff water, called a watershed, is generally done using the concept of Basin Prioritization. Since the entire basin of a river or a stream cannot be managed with equal importance at the same time, the entire basin of the river is divided into sub-basins. Watersheds, for instance, are deemed as a foundational erosional landscape feature where land and water bodies intersect clearly (Bharath et al., 2021). Also, Watershed Management is important for the conservation of soil and water resources and also their long-term sustainability (Krishnan et al., 2017, Poongodi and Venkateswaran, 2018). Several Morphometric characters are taken into consideration for each and every sub basin, and further analysis is done using Analytical Hierarchy Process, to understand which particular sub basin is susceptible to soil erosion the most. The area of study in this case is the Damodar basin in the side of West Bengal, and several linear and areal parameters have been derived. The river is known as the sorrow of Bengal for obvious reasons, and now the matured days of the river also concerns the bank erosion and the need of its management has become essential. Although the entire work can be done with field techniques and analyzing Morphometric characteristics from toposheets, Geospatial Techniques and softwares have been used in this case. Watershed prioritization is a necessary step to undergo any major step of development or construction, despite the basin area being huge. The prioritization of watersheds varies with the objectives of different schemes but the basic framework of watersheds remains the same.

Keywords- Basin prioritization, Analytical Hierarchy Process, Geospatial Techniques, Soil Erosion.

Sustainable Domestic Water Management in Midnapore, West Bengal: Challenges, Strategies, and Community Engagement

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Abstract:

Domestic water management in Midnapore, West Bengal, plays a critical role in addressing the region's water needs, considering its socio-economic dynamics, geographical features, and environmental challenges. This abstract provides an overview of the current scenario and key strategies for sustainable domestic water management in the region. Midnapore, situated in West Bengal, faces significant challenges regarding water availability and quality for domestic use due to factors such as rapid urbanization, population growth, inadequate infrastructure, and variable precipitation patterns. These challenges exacerbate issues of water scarcity and uneven distribution, impacting the daily lives of residents. Efficient water management strategies are imperative to mitigate these challenges. Initiatives include the implementation of rainwater harvesting systems to capture and store rainwater, promoting community-led conservation practices, upgrading existing water infrastructure, and leveraging technology for efficient water distribution and monitoring. Additionally, awareness campaigns focusing on water conservation, efficient usage practices, and sanitation are crucial to foster a culture of responsible water consumption among the residents of Midnapore. Collaborative efforts involving government bodies, local communities, non-governmental organizations, and other stakeholders are essential for the success of sustainable water management programs. Integration of traditional knowledge with modern techniques and ensuring equitable access to clean water are fundamental for addressing the water-related issues in Midnapore.

Keywords: Collaborative efforts, socio-economic dynamics, urbanization, water management.

**Severe negative deviation of groundwater level and storage changes in Purulia District,
part of Manbhum Singhbhum Plateau**

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Abstract:

Groundwater is the third-largest water resource and the primary source of freshwater worldwide. In recent days, the quality and quantity of this resource have been declined due to excessive extraction for irrigation and drinking. Manbhum-Singbhum Plateau of the Indian Subcontinent experiences severe water crises, particularly in the summer months. Therefore, it is essential to evaluate the magnitude of groundwater table fluctuations and storage changes in this extended part of the Manbhum-Singbhum Plateau. The principal objectives of this present study are i) to assess the rate of groundwater table fluctuations in the last two decades using observed datasets and ii) to estimate the groundwater storage changes using Gravity Recovery and Climate Experiment (GRACE) data datasets. Innovative trend analysis (ITA) methods have been applied to estimate the rate of groundwater fluctuation. Cloud-based Google Earth Engine (GEE) platform has been used to estimate groundwater storage changes over the study area. According to the result of ITA, about 40% and 67.5% of studied sites had falling tendencies of the groundwater table. In terms of groundwater storage changes, the highest (9.484 cm) was in July 2004 (wet months) whereas the lowest (-30.21cm) was in March 2016 (dry months). Overall results indicate a massive negative trend in groundwater fluctuations and storage. Outcomes of this study will support to execution of water resources management in this semi-arid region.

Key words: Gravity Recovery and Climate Experiment (GRACE); Innovative Trend Analysis (ITA); Google Earth Engine (GEE); Groundwater storage, Groundwater Table

Water Management: Ensuring Sustainability and Conservation

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Abstract:

Water, a fundamental resource for life, faces escalating challenges globally, including scarcity, pollution, and uneven distribution. Addressing these issues necessitates strategic water management approaches to ensure sustainability and conservation. This abstract delves into the significance of efficient water management, emphasizing its pivotal role in sustaining ecosystems, supporting economic development, and meeting societal needs. It outlines multifaceted strategies encompassing conservation, infrastructure enhancement, technological innovations, community engagement, and policy implementations. Furthermore, it highlights the critical aspects of international cooperation, climate change adaptation, corporate responsibility, research investment, and continual monitoring for effective water resource governance. This abstract underscores the imperative nature of holistic water management practices to safeguard this precious resource and secure a viable future for generations to come.

Keyword- Water Management, sustainability, conservation, holistic water management

WATER RESOURCES

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Abstract:

Water, an indispensable resource for life, is essential for the sustenance of all living organisms on Earth. However, the world faces significant challenges regarding water scarcity, pollution, and unequal distribution. Effective water management is crucial to address these issues and ensure a sustainable future. Here are key points highlighting the significance and strategies for efficient water management.

Agriculture utilizes around 70 % of the accessible freshwater in the world. In the entire world, most farming depends on flood irrigation — where fields are doused with water and overabundance keeps running off into close by streams and waterways.

But flood irrigation squanders huge amounts of water and can pollute conduits with composts, creating dead zones in the ocean (where oxygen is used up and not accessible for marine animals) and adding to algal blossoms, which can be poisonous to marine life.

Importance of Water Management: Sustainable Development: Proper water management is vital for agriculture, industry, and domestic use, supporting economic growth while safeguarding ecosystems.

Technological Innovations: Smart Water Systems: Utilize Iot (Internet of Things) and sensor technologies to monitor water usage, detect leakages, and optimize water distribution.

Desalination and Water Reuse: Explore desalination techniques and promote water recycling to convert unusable water into a valuable resource.

International Cooperation: Transboundary Water Management: Foster collaboration among nations sharing water bodies or river basins to ensure equitable usage and minimize conflicts over water resources.

Business and Industry Responsibility: Corporate Sustainability: Encourage industries to adopt sustainable water practices, reduce pollution, and invest in water-saving technologies as part of their corporate social responsibility.

GEOSPATIAL APPLICATIONS IN GEOSCIENCES AND DISASTER MANAGEMENT

Geospatial application of tropical cyclone disaster management: A review

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Abstract:

Tropical cyclones and their often-devastating impacts are common in many coastal areas across the world. The application of remote sensing in cyclones involves using satellite or aerial imagery to track, monitor, and predict cyclones. This technology enables real time data collection on cyclone formation, trajectory and intensity, significantly improving disaster management and mitigation strategies. In essence, Remote sensing offers a more accurate, timely and efficient approach to cyclone prediction, saving lives and reducing property damage. As technology continues to evolve, Remote sensing will remain a valuable tool in mitigating the devastating effects of cyclones and safeguarding vulnerable communities. Remote sensing helps in cyclone monitoring and tracking by using satellite data to visualize cyclone development and movement. It provides real time data on cyclone location, size, intensity and wind speeds which helps in forecasting the cyclone's path and potential impacts. For estimating cyclone intensity through remote sensing, sensors like the Advanced Microwave Sounding Unit (AMSU) the Special Sensor Microwave /Imager (SSM/I) and the Advanced Very High-Resolution Radiometer (AVHRR) are used. Remote sensing contributes to storm surge prediction by monitoring sea surface height and temperature, wind speed and atmospheric pressure. After a cyclone, remote sensing aids in flood mapping by capturing satellite images of the affected areas which is crucial for disaster response teams to prioritize rescue and relief operations, assess damage and plan for rehabilitation.

Keyword- Remote Sensing, Cyclone, Satellite, Sensors, Rehabilitation

Resilience in Adversity: Understanding Community Response, Risk Mitigation, and Recovery Strategies in Cyclone-Affected Digha coastal area, West Bengal, India

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Abstract:

This abstract delves into the intricate dynamics of community response, risk mitigation, and recovery strategies within the cyclone-affected region of Digha, situated in Purba Midnapore, West Bengal, India. It offers insights into the resilience and adaptive measures adopted by the community following the impact of cyclones, focusing on their responses to adversity. Digha, a coastal area prone to cyclonic disturbances, faces recurrent challenges due to these natural disasters, impacting lives, livelihoods, and infrastructure. Understanding the community's responses, risk perception, and mitigation strategies becomes imperative to facilitate effective disaster management and enhance resilience.

The study investigates the multifaceted dimensions of community responses, encompassing immediate reactions during cyclone occurrences, risk perception, and the adoption of mitigation measures before and after the calamity. It examines the roles of community-based organizations, local leadership, and traditional knowledge in shaping preparedness and recovery initiatives. Additionally, the study highlights the resilience demonstrated by the community through the implementation of adaptive strategies, post-disaster rehabilitation efforts, and the utilization of available resources to rebuild livelihoods and infrastructure.

Insights into the challenges faced by the community and the efficacy of various strategies employed for risk reduction and recovery provide valuable lessons for disaster management practitioners, policymakers, and stakeholders. The study emphasizes the significance of community-centric approaches, collaborative efforts, and the integration of local knowledge systems in fostering resilience and sustainable recovery in cyclone-affected regions like Digha, Purba Midnapore, West Bengal, India.

Assessment of Gully Erosion and Landscape Transformation using DSAS and CA–Markov Model: Evidence from part of the Chotanagpur Plateau Region in West Bengal

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Abstract:

Gully erosion and changes in land use/land cover (LULC) are intricately connected and wield a substantial influence on both the natural ecosystem and the socioeconomic activities of residents. In contemporary times, advanced technological methods have supplanted outdated techniques for assessing gully erosion. The Digital Shoreline Analysis System (DSAS), originally devised for evaluating coastal erosion, has discovered applications in analyzing gully erosion. This study explores gully erosion and land transformation using automated DSAS in combination with the CA–Markov model in two micro-watersheds, namely Raiboni (RW) and Sita Nala (SNW), situated along the right bank of the Subarnarekha River. The study spans the period from 2002 to 2022 and projects trends up to 2032. We subjected our model to various statistical tests, including ROC and Standard Error test to validate its accuracy. The comprehensive analysis of the results showed that SNW exhibited a higher rate of gully erosion (-0.49 m/year) in comparison to RW (-0.15 m/year). Furthermore, this observed trend is anticipated to persist into the foreseeable future, up to the year 2032. A sequential analysis of LULC transformations indicates that the SNW (74.99%) experienced more significant land dynamics compared to the RW (44.49%). Among the five classes of land transformation, the highest change observed in the RW was from bare land to agricultural land (26.41%), while in the SNW, it was from vegetation to agricultural land (31.09%). Consequently, this research serves as a spatial guide for landscape and gully erosion management, potentially contributing to the promotion of sustainable land management practices.

Keywords- Gully erosion; LULC; DSAS; CA–Markov model; Subarnarekha River

**Quantifying Temporal Changes in Gully Erosion Areas with Object Oriented
Analysis of Gangani Danga, Paschim Medinipur, India**

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Abstract:

Gully erosion is an important sign of land degradation, rendering slopes unfit for agriculture and forming an important source of sediment in a range of environments. It is considered as one of the indicators of dry environment and desertification. Hence, mapping existing gullies (both permanent and ephemeral) and their activity over a period of time is crucial in monitoring land degradation and its environmental and socio-economic effects. Field-based methods were used until aerial photos and later satellite imagery became readily available for visual interpretation and image processing techniques. In addition to mapping features such as gully dimensions and location it is also important to understand the dynamics of gully development, mainly the increase in its area- gully system area and density. It is not only important from a scientific or geomorphological perspective, but also to enable land managers to develop sustainable planning strategies for appropriate utilization of land, that include both stabilization of gullies, as well as prevention of gully formation in areas that are considered sensitive. The data used in the study collected from Google image with 0.5×0.5 m resolution, toposheets of the study area. Quantification of gully erosion dynamics can assist in understanding gully formation and spatiotemporal evolution. Visual stereoscopic analysis of series of aerial photographs has previously been used to measure temporal changes (only with sufficiently large changes in morphology over time) in length, area, volume or density (total length, total number) of various gullies. With availability of repeatedly acquired satellite imagery temporal analysis of changes in active area of gully complexes became possible for long-term change studies.

**Fluvio-hydrological study of channel avulsion and planform dynamics of
transboundary river Jaldhaka**

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Abstract:

Himalayan Foreland Basin (HFB) and piedmont slopes are being modified by the Himalayan origin river systems. In this present study, spatiotemporal changes of channel planform of a braided river Jaldhaka have been estimated within HFB. United States army map (1956) and landsat satellite images like 1980-MSS, 1990-TM, 2000-TM, 2010-ETM+ and 2022-OLI have been used for the delineation of channel banklines, Channel Length (CL) and Sinuosity Index (SI), Braiding Index (BI), spatiotemporal measurements of channel widths, identification of partial channel avulsion sites (eight sites) and temporal bankline migration using DSAS toolbar (Digital Shoreline Assessment System). LRR (Linear Regression Rate), NBM (Net Bankline Movement) and EPR (End Point Rate) were calculated for the bankline migration within last 66 years (1956 to 2022). However, results revealed that the lower reach of Jaldhaka is more sinuous (maximum average channel sinuosity (1.65) which was observed in reach-III compared with reach-I (1.29) and II (1.11)) than other two reaches and the maximum channel width was in the year 2022 (968.6 m) and minimum average channel width was in 1956 (239.87 m). The maximum BI value (3.55) has been calculated in the sub reach-2 (SR-2, reach-I) near Tandukh and Khairbari. Similarly, DSAS output shows maximum average EPR value (6.43 m/year) in lower reach (left bank) of Jaldhaka which was most erosion prone bank in this reach over the study period. Moreover, the variation of channel discharge, velocity, presence of vegetation and anthropogenic interventions controls the nature of planform changes of Jaldhaka River.

Keywords- Spatiotemporal changes; Braiding Index (BI); Jaldhaka River; Himalayan Foreland Basin (HFB); Channel avulsion.

**Assessment of Unraveling Geomorphic Threats of Tidal Intrusions and Soil Salinity by
the using of Geospatial Tools on Purba Medinipur Coastal Plain, W.B.**

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Abstract:

Coastal regions are highly vulnerable to various geomorphic threats including tidal intrusions, which have significant implications for land use patterns and soil salinity levels. The Purba Medinipur Coastal Plain in West Bengal, India, experiences these geomorphic threats due to its proximity to the Bay of Bengal. Understanding the impacts of tidal intrusions on tidal land use change and soil salinity in this region is essential for effective coastal zone management and sustainable development. This study focuses on unraveling the geomorphic threats posed by tidal intrusions on coastal land use change and soil salinity in the Purba Medinipur coastal plain, employing geospatial tools for a comprehensive assessment. The geospatial analysis allows for the accurate characterization and analysis of these threats, enabling informed decision-making and targeted mitigation strategies. The study utilizes remote sensing data and Geographic Information Systems (GIS) to capture and analyze in spatial dynamics of tidal intrusions and their impacts on land use change. By utilizing the high-resolution satellite imagery and elevation data, the extent and distribution of tidal inundation areas can be mapped, providing valuable insights into the areas affected by tidal intrusions and subsequent land use changes. In addition, geospatial tools are employed to assess soil salinity levels, which are influenced by tidal intrusions. By integrating field measurements with geospatial analysis techniques such as spatial interpolation and Geostatistical analysis the special variability of soil salinity across the Purba Medinipur coastal plain can be evaluated. This assessment helps identify regions experiencing elevated salinity due to tidal intrusions, highlighting the areas most susceptible to adverse impact on agricultural productivity. The coastal plain serves as a pertinent case study to understand the geomorphic threats posed by tidal intrusions on land use change and soil salinity. By unraveling these threats through geospatial analysis, the research aims to enhance our understanding of the specific challenges this coastal region faces and inform decision-makers and stakeholders about effective coastal zone management strategies. The findings of these studies have bordered implications for coastal regions facing similar geomorphic threats globally. By unraveling the interactions between tidal intrusion and land use change and soil salinity, this research contributes to the development of resilient and sustainable coastal communities. The insights gained from this study will support evidence-based decision-making, facilitating targeted intervention to mitigate the adverse impacts of tidal intrusions on coastal land use and soil salinity in Purba Medinipur Coastal Plain and beyond.

Keywords- Coastal Regions; Tidal Intrusion; Soil Salinity; Land use Change; Geospatial Tools

Rice Aroma influence by Rhizospheric bacteria

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Abstract:

Rice (*Oryza sativa* L.) is the most important staple food throughout the world mainly in the East Asia, South Asia, and Southeast Asia. According to FAOSTAT-2012, rice is the highest producing grain after the maize and wheat. Due to excessive use of chemical fertilizers beneficial flora of soil are inhibited. In this situation several bio-stimulating microbes can to be maintained soil health as well as nutritional status. The present study has demonstrated the isolation, characterization and comparative analysis of rhizospheric bacteria from scented (from Sabang) and non-scented rice (from Mecheda).

After gram staining, biochemical and carbohydrates fermentation test, we have successfully identified 4 species i.e. *Pseudomonas* sp., *Enterobacter* sp., *Sterptomyces* sp. and *Azospirillum* sp. Rice rhizobacterial strains of *Pseudomonas*, *Enterobacter* and *Acinetobacter* has been reported as producers of 2-acetyl pyrroline (2AP). From our present research we have successfully isolated *Enterobacter* sp. and *Pseudomonas* sp. from scented rice rhizospheric soil. These findings have suggested that microbial diversity can enhance aroma of scented rice.

Keywords- Rhizospheric bacteria; Morphological; Scented rice; Aroma, 2-acetyl pyrroline

GEOSPATIAL APPLICATIONS IN ENVIRONMENT & CLIMATE CHANGE

Soil Organic Carbon Stock Variability across Diverse Land Use Systems

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Abstract:

Soil organic carbon (SOC) stock plays a pivotal role in the functioning of terrestrial ecosystems and has significant implications for global carbon cycling. This study aims to investigate the variability of SOC stocks across various land use systems. By conducting a comprehensive analysis encompassing different land use practices, including forests, croplands, grasslands, and urban areas, this research evaluates the impact of human activities and natural processes on SOC accumulation and distribution. The investigation employs a combination of field surveys, soil sampling, and laboratory analyses to quantify and compare SOC stocks in different land use categories. Factors influencing SOC variability, such as vegetation cover, management practices, soil types, and climatic conditions, are examined to elucidate their contributions to carbon sequestration or depletion in these diverse environments.

Preliminary findings indicate distinct differences in SOC stocks among land use systems, reflecting the complex interplay between land management practices and natural ecosystem dynamics. Forested areas exhibit higher SOC stocks attributed to the accumulation of organic matter from vegetation and litter decomposition, while agricultural lands and urban areas often demonstrate altered SOC levels due to human activities, land-use change, and soil disturbance. Understanding SOC stock variations across different land use systems is crucial for formulating sustainable land management strategies and mitigating climate change effects. This research aims to contribute valuable insights into the intricate relationship between land use practices and SOC dynamics, aiding in the development of policies aimed at preserving and enhancing soil carbon stocks for long-term environmental sustainability.

Keywords- climate change, environmental sustainability, land management, terrestrial ecosystems.

Analysis of Shoreline Changes along East Midnapore Coastal Tract of West Bengal, India: An Application of Digital Shoreline Analysis System (DSAS)

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Abstract:

Analysis of Shoreline changes is one of the most important aspects in the finding of coastal accretion, erosion and the study of coastal morpho dynamics. The coastal erosion is extremely vulnerable for coastal disasters. The study has been conducted along the coast of East Midnapore district of West Bengal, India with the help of multi-temporal satellite Landsat images of 1975, 1988, 1996, 2003, 2014 and 2022. The continuing coastal erosion and accretion rates have been calculated using the Digital Shoreline Analysis System (DSAS) version 5.0, an extension of ArcGIS (version 10.4) software. Linear regression rate (LRR), End Point Rate (EPR) and Weighted Linear Regression (WLR) are used for calculating shoreline change rate. Based on the calculations the shorelines of the study area have been classified into five categories such as high erosion, moderate erosion, low erosion, high accretion and low accretion. Out of 55.22 km of the coast line, high erosion occupied 1.5 km followed by moderate or low erosion of 25.69 km. 4.40 km coastal line showed no change. Moderate accretion along 10.93 km and high accretion along 12.70 km. The analysis shows that erosion is prevailing in Udaypur, Old Digha, New Digha, Sankarpur, Tajpur and Mandarmoni beach. The Junput, Bankipur & Petuaghat fishing port beach are accreting. The natural and human activities along the coast are the main causes of the erosion and accretion. Keeping in view of the vulnerability of the coastal erosion due to increasing human activities adequate protection measures are the urgent need of the hour.

Keywords- Shoreline Change, Erosion, Accretion; DSAS, Linear Regression Rate

Spatio-temporal analysis of spectral in the deltaic ecosystem of the Indian Sundarbans

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Abstract:

Forming the delta of the Ganga-Brahmaputra Rivers, the Sundarbans area represents the world's most extensive mangrove forests, covering about 10,000 km². The significance of the area was recognized by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1987 when it was named a World Heritage Site. The dynamic nature of the Sundarbans mangrove ecosystems and their sustainability amid anthropogenic forcing has been a long-running concern to environmentalists and others who rely on the mangroves. The locations of mangrove forests play an essential role in determining the changes the forests undergo in response to anthropogenic and environmental changes. The indicators estimated in the present study exhibit frequent fluctuation across the Indian Sundarbans. Past research has demonstrated that mangrove ecosystems are highly susceptible to climate change. The current study explores the relationship between different spectral indices derived from remote sensing using Landsat Multispectral Scanner (MSS), Thematic Mapper (TM), and Operational Land Imager (OLI) satellite images as indicators of mangrove conditions. Specifically, this study analyses changes in the Normalized Difference Salinity Index (NDSI), the Normalized Difference Vegetation Index (NDVI), and the Land Surface Temperature index (LST) across the Sundarbans from 1972 to 2022. Raster values for NDSI positively correlate with measured soil electrical conductivity (EC). Results show that NDVI has declined while NDSI and LST have increased. LST rose by about 0.9⁰ C between 1995 to 2022. Over the last 50 years (1972- 2022), the maximum NDVI values have decreased by 0.54, while the maximum NDSI has increased by 0.7. The average surface temperature across the Sundarbans has generally increased, but increases are more pronounced in those areas where the depletion of forest cover has been most significant. The mangrove forests grow at higher rates in environments with more moderate temperatures. Increases in salinity are shown to reduce the growth of less saline-resistant mangrove species, suggesting that salinity causes changes in species types and density. This means salinity is one of the driving factors behind changes in the spatial distribution of mangroves in the Sundarbans. Salinity appears to affect the types of mangrove species that grow but not the density of vegetation cover. Changes in these indices help identify potential safeguard measures to protect the fragile ecosystem, which will inform policy related to sustainable mangrove management.

Keywords– Mangrove, NDVI, NDSI, Electric Conductivity, LST, Sundarbans.

Spatiotemporal Analysis of Air Pollution Using Multi-Temporal Remote Sensed Imagery: A Case Study of Haldia Industrial Area, West Bengal, India

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Abstract:

Land transformation is main symbol of degradation of Air . Air pollution is a worldwide environmental hazard that poses serious consequences not only for human health and the climate but also for agriculture, ecosystems, and cultural heritage (M.J.Costa, D.Bortoli 2022), which concentrates mostly in Industrial and urban area. Last few years increased vehicular activity leading to enormous amount of fuel consumption and all other activities like construction, power generation and rather all other anthropogenic activities are playing a crucial role for increasing air pollution. In this study researchers utilized and combining Geospatial Techniques with Daily pollutant concentration data and subindex were obtained from Bhawanipur, Bhunia Raichak, Supermarket, and WBIIDC for 2011, 2015, and 2019. Recent data from 2020 to 2022 were excluded from the study to quantify air quality on a temporal scale in haldia industrial area, covering approximately 102 sq. km purba medinipur, west bengal , where all the monitoring stations are situated in industrial centers and function nearby making a larger part unmonitored. Remote sensing is use for assessment of air quality index. Initially, six causative factors, namely CO₂,NO₂,O₃,SO₂, and PM₁₀ (Particulate matter smaller than10),PM_{2.5}(Particulate matter smaller than2.5). The final outcome of this case study is awareness in rapidly industrial sections of Haldia to avoid possible environmental hazards.

Keywords- Air pollution, Spatio-temporal analysis, Air quality index.

Climate Change analysis for Bengals Dry-land area Sustainable Development under Projected Climate Conditions

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Abstract:

Climate change and human activities in Drylands are some of the most sensitive areas around the globe. Assessment of future climate trend scenarios provides valuable practical information for dryland management decision-making. In recent, more than 50% of global drylands will expand by this century, with a maximum (78%) of newly expanded dryland occurring in developing countries. To understand the potential for expansion of drylands and desertification, we examine critical predictor variables (temperature and precipitation) of Bengal dryland expansion to guide early actions to mitigate and prevent desertification. Using trend analysis of bias-corrected CMIP6 projected climate change data for temperature and precipitation (2022-2041), results indicate future dryland expansion is possible from increases in temperature and declines in monsoonal precipitation. Over the next two decades (2022-2041), Bengal dryland areas will be 0.1-0.5°C warmer, and rainfall will decrease by 2.57-13.43cm total during the monsoon period. Given these variables are critical predictors of dryland expansion because of their role in driving evapotranspiration and soil moisture deficits; we anticipate an increase in the population affected by water scarcity, land degradation, and desertification. Our work provides information critical for effective dryland management, biodiversity conservation, and land-use planning under future climate conditions.

Keywords- Climate Change, Dryland, Prediction, Trend analysis, management.

**Watershed management plan in climate change scenario for sustainable development;
Kansachara a Case, West Bengal, India**

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Abstract:

This study sought to provide a protocol for defining sustainable watershed management of dry-land area. Appropriate distribution of water to socially and economically backward classes of people can be provided in times of need. The study area suffer by Vigorous monsoon (May to October) almost every year. Primarily, water resource management is to be carried out on micro-watershed wise. Being a distinct hydrological unit, integration of both surface and sub-surface water are availability to be tuned with land use practices as well as socio-economic considerations. In this respect, water may be considered as an economic resource and may not be perceived as a free and indefinite supply – emphasis should be given on social awareness programmers. Geoinformatics based Drainage morphometric characters at micro watershed level. ii) Calibration and validation of a deterministic SCS-CN and SYI model in simulation of runoff and sediment yield response from the study area. iii) GIS overlay analysis applied for Site suitability analysis for rainwater harvesting structures (RHS).

For development of dry-land cultivation, necessary to increase water availability and develop irrigation system through suitable side select of different rain water harvesting structures for domestic use as well as live saving agriculture purpose in Climate change scenario. It's providing a protocol for dry-land area watershed management in changing climate scenario.

Keywords- SCS, CN, SYI, RHS

Evaluation of the entropy-based investigation of rainfall variability over the Lower Gangetic Plain of West Bengal (LGPWB) during the last century using geospatial technology

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Abstract:

The methodologies introduced by Feng et al. (2013) and Pascale et al. (2014, 2015) using Relative Entropy (RE) and Dimensionless Seasonality Index (SI) were applied to 18 IMD stations in the Lower Ganga Plain of West Bengal (LGPWB), Eastern India. The findings accurately depict trends, peak season timing, and the wet season's duration in LGPWB areas. RE precisely determines the wet season as June to September, corresponding to the monsoon period in the study area. SI attributes identify the heavy rainfall month prevalent in LGPWB as August. Reflecting heavy rainfall months, particularly August-September. The methodology reveals insignificant rainfall variability within LGPWB's monsoon season. The Rainfall Anomaly Index (RAI) and Interquartile Range (IQR) confirm this insignificance through the Box and Whisker plot. Furthermore, the study employed the non-parametric Mann-Kendall test and Sen's slope estimator to detect rainfall trend direction over 52 years on a monthly, seasonal, and annual basis. Spatial interpolation illustrated rainfall distribution patterns over time. Results showed a positive trend in the southern Gangetic floodplain region and a negative trend in the north Rarh plateau region for annual and monsoonal rainfall. Winter recorded a significant negative trend across this area, particularly in the dry and red lateritic zone's northwestern parts. Notable declining rates of rainfall in February and March indicated increasing dryness in winter. Monsoonal character shifts towards the post-monsoon season, with delayed onset and offset timing in June and shifting towards September and October. Variations in the western plateau region indicated decreasing monsoon rainfall and increasing post-monsoon rainfall. The alluvium floodplain and coastal deltaic regions showed increased rainfall during monsoon and post-monsoon seasons over the 20th century.

GEOSPATIAL APPLICATIONS IN HEALTHCARE SYSTEM

The Impact of COVID-19: A Global Perspective

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Abstract:

The outbreak of COVID-19, caused by the novel coronavirus SARS-CoV-2, has emerged as an unprecedented global health crisis, reshaping societies, economies, and healthcare systems worldwide. This abstract examines the multifaceted impacts of the pandemic across various dimensions. Firstly, it delves into the immediate health repercussions, highlighting the virus's rapid transmission, overwhelming healthcare infrastructures, and the immense toll on human lives. Additionally, it discusses the socio-economic ramifications, encompassing widespread job losses, disruptions in education, and disparities in access to healthcare services, exacerbating existing inequalities. Moreover, the pandemic has spurred innovative responses, catalyzing advancements in telemedicine, remote work, and vaccine development. Furthermore, the psychological toll of prolonged isolation, fear, and uncertainty is another critical facet. Finally, the abstract emphasizes the global solidarity and collaborative efforts undertaken to combat the pandemic, underscoring the importance of coordinated responses, vaccination drives, and adaptable public health measures in navigating the ongoing challenges posed by COVID-19.

Urbanization and it's impacts on Global Society

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Abstract:

Urbanization is not a modern issue, developed countries have been improving themselves through urbanization since ancient times. Just as urbanization has turned a developing country into a developed country, On the other hand, this urbanization caused the world society to face various problems. Hence this urbanization has become a topic of current debate within geography.

Mainly, it can be seen that as a result of the abundance of the industrial revolution, the seeds of urbanization were created in the minds of the common people. People start moving from the village to the city to enjoy various opportunities to meet their own interests, as a result of which the common people solved their financial problems. The solution also increases the rate of higher education and people's lives become easier.

But at recent this urbanization has become an important problem in world society. Just as urbanization has provided various opportunities to the common people, on the other hand this urbanization has created an unhealthy environment for the common people. The increase in urbanization has increased the demand for housing, people has been destroying forests and building unplanned settlements, resulting in an increases in slums, food insecurity, transport crises and the most life-threatening drinking water crisis.

For example, the city of Kolkata in West Bengal can be mentioned, as a result of urbanization, the population of Kolkata began to increase rapidly. As a result of the British establishing Kolkata as the capital of India in the 18th century Kolkata was surrounded by various industrial and commercial centers. As a result of this urbanization the population of Kolkata city increased rapidly and the demand for habitable settlements increased, as a result of which the common people began to build houses everywhere, thus increasing the amount of slum areas, as well as increasing the amount of population, land misuse and transportation problems.

In other words, it can be seen that in the beginning this urbanization made human life easier and butter but now due to the increases in human needs this urbanization has emerged as a major problem for global society.

Integration of GIS techniques in mapping of urban sprawl and predicting future growth in Midnapore & Kharagpur Town, India

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Abstract:

The term urban sprawl describes the rapid expansion of urban areas based on by unplanned, uncontrolled, and uncoordinated growth. Therefore, for urban planning beyond the traditional borders, the direction and measurement of urban expansion are crucial. The goal of the current study is to evaluate the distinct and temporal pattern of urban growth in terms of scale and direction. Using the Shannon's entropy model and the Normalized Difference Built-up Index, CA Markov Model this study reflects the current trend as well as future trends and pattern of the urban sprawl in Midnapore and Kharagpur town from 1991 to 2021. It was found that the urbanized area increased from drastically in Midnapore town 11.99% (2.34 sq. km) to 58.46% (11.40 sq. km) and also in Kharagpur town 12.23% (5.40sq. km) to 42.58% (18.70 sq. km) between 1991 and 2021. The LST study evidenced that in between 1991 and 2021, there was a significant shift in the temperature's regional pattern. The hottest temperature in October month of 1991 was only 22°C; by 2021, it had risen to 27.47°C, a roughly 5.5°C increase in Midnapore town. In case of Kharagpur town highest temperature in October month of 1991 was only 28°C; by 2021, it had risen to 36.51°C, a roughly 8.5°C increase. Both towns facing increasing trends of temperature due excessive urban expansion and industrial development specially for Kharagpur town. Major drivers of urban growth include the distribution of reclaimed land, relatively cheap land prices, the advantages of open space on the periphery of town, the possibility of income, rapid growth of industrial activity in both towns. Therefore, the concerned authorities and the citizens ought to consider every effective and utilize imaginative plans on emergency basis to make a bearable city for all.

Key Words: Urban sprawl, Shannon's entropy model, CA Markov chain model, LST

The impact of Globalization on cultural landscapes

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Abstract:

In social science, Globalization is an important and popular concept of world it has become a important topic in current geography. Globalization, which makes the world of commerce and technology more connected and interdependent, eliminates all state restrictions in this global process. Paved the way for free exchange in political, cultural fields.

Professor Roland Robertson first coined the term Globalization. Globalization means mirror of the world. Political scientist Marshall McLuhan spoke of the time being part of a village-centric reality that transcends world borders. The role of Globalization is immense in meeting the needs of the present world and making the economy stronger.

The nature of Globalization can be mainly divided into four aspects. Namely economic aspect, political aspect, cultural aspect, environmental aspect. The main topic of discussion here is the impact of global Globalization on the cultural aspect.

The main objective of cultural Globalization is to create a homogeneous cultural all over the world. As a result, our daily life is better getting better. Similarity is being observed in global diversity in various fields such as clothing, food, literature, music etc.

As a result of technological advancement, the cultures of different states have spread globally and multiculturalism is spreading. Also developed in rational knowledge and research. Which we are exposed to through various media such as radio, television, films, internet, books etc.

Today due to this globalization we are facing various problems, due to globalization people are more attracted towards western culture in some cases victims of subculture. Regional cultures are on the brink of destruction. Cyber-crime has increased. Also, the gap between developed and developing countries is becoming more pronounced and developing countries are becoming dependent on developed countries.

The vision of globalization to see the world in the same mirror although globalization has some negative effects, it is proceeding at its own space. So, it is our job to reap the benefits of the positive aspects while paying careful attention to its negative aspects.

Geoinformatics for Spatial Distribution and Stage Categorization of Open Pit Mines, A Case Study on Sukinda Valley Mining Region, Orissa

Aditi Bose*¹ & Dr. Abhisek Chakraborty²

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Abstract:

This study focuses on the spatial distribution and stage categorization of mining area of Sukinda valley near Keonjhar and Jajpur district boundary of Orissa. The application of Remote Sensing and GIS technique for identification and mapping of different mining activities have been accepted as most unique, accurate and economic method than any other conventional method of mapping due to its repetitive coverage and synoptic view. It also a time saving method. In this process, Landsat ETM+ and Resource Sat P6 – LISSIII, geocoded, FCC images in respect of SOI toposheets No. 73 G/16 and 73G/12 in 1:40,000 scale were interpreted and mining maps were prepared highlighting all the mining activities. Subsequent ground truthing was carried out using GPS and ground details were recorded and incorporated into the pre-field interpreted maps and the maps were finalized using GIS & RS technique. An area covering around 20 km radius (length) and 842.30 sq.km area of the active mine situated at the center of the valley were mapped. During ground truthing another part and parcel is noticed that in this valley only Chromite is available due to the geological and lithological structure of the Sukinda Valley. The study delineated different mining activity like Active mine, abandoned mine, Discontinued mine, over burden dump, wash off zone, mine tailings, run of material (ROM) and Stock pile. The other objectives of the investigation are to analyse spectral reflectance of chromite open pit mines; to observe the change detection of mining area; to get enlightened about surficial geology and lithology of mining area; to delineate the area occupied by different mining activity.

Keywords: Remote Sensing, GIS, Sukinda Valley, Change Detection, Mining Activity, Spectral Reflectance

Application of GIS and Wroclaw taxonomic method for the Identification of Agriculturally Problematic blocks of West Bengal

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Assistant Professor, Sukumar Sengupta Mahavidyalaya

Abstract:

West Bengal is predominantly an agricultural state of eastern India and plays a vital role in its economy. The status of agriculture in comparison to other state of India is not so satisfactory though this state has all potentialities in terms of climate, soil, water availability. Because there is a wide variation of such potentialities in local level or block level. Present study aims to identify those blocks having agricultural problem on the basis of two well-known methods like Wroclaw Taxonomic Method and Weightage overlay method. On the basis of Wroclaw taxonomic method, since 1995 to 2015, 2001 is the most problematic year as 99 % blocks of this state have low agricultural status. Purulia, Purba Medinipur, S 24 Paragana, Howrah, Darjeeling, Bankura, Jhargram, Paschim Burdwan and Birbhum are more problematic districts in agriculture. From the analysis of both methods, it is identified that western, southern and northern districts have problematic blocks because of having low to moderate agricultural status. In crop wise status, more than 40 % blocks of this state have low to moderately low status in aus paddy, jute, til, and wheat.

Key words: Wroclaw taxonomic method, Weightage overlay method, agricultural status, Problematic block.

Air pollution vs human health

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Abstract:

Air pollution is a serious threat of environment, which adversely affect on human health, biodiversity, and natural ecosystem. During rapid industrialization and unplanned urbanization, the atmospheric air quality is reduced day by day. The common air pollutant (PM10 and PM2.5, NO₂, SO₂, CO) can damage brain, create heart problems, cancer and neurological disorders as well as skin diseases. The aim of this research is assessment of air quality in adjoining region of Kolaghat thermal power through lichen. Lichen can be used as bio-indicator organism that is basically symbiotic association of algae and fungi. Lichens have certain characteristics that make them ideal biomonitoring organisms: the perennial nature, absence of root or other special organs for uptake of nutrients and lack of cuticle which enable them to absorb metals directly from the atmosphere. These fascinating organisms can absorb and retain pollutants, making them valuable bio indicators for air quality assessment. Lichens are cheap indicators of atmospheric pollution because of their high sensitivity towards ambient microclimatic changes, which can be monitored on quantitative and qualitative scale. We have noticed that hazardous metals including life threatening heavy metals (e.g. Pb, Cu, Fe, Zn, As, and Hg) significantly are found in lichen thallus. The chlorophyll content and carbohydrate content of lichen are low in more polluted area. This comprehensive study will contribute to the growing body of knowledge on using lichens as efficient bioindicators for air quality assessment in Kolaghat thermal power area of the state of West Bengal and to assess their effect on lichen diversity. This research paper aims to analyze and assess the air pollution indicators in this region to gain a comprehensive understanding of the prevailing air pollution control and mitigation. It provides insights and recommendations for incorporating lichen-based air pollution monitoring into existing environmental management practices.

Key Words: Bio-monitoring, Lichen, Thermal Plant, Heavy metals, bio-indicator

GIS and GPS in Health and Social Care Planning: A Case Study of Sheliguri

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Abstract:

Application of Health data maps and Geographic Information Systems (GIS) are important resources for health planning and health services delivery, particularly at the local level. The ability to visualize the spatial distribution of health status determinants and indicators can be a powerful resource for mobilizing community action to improve the health of residents. Currently, health data maps and other GIS applications tend to be highly technical and specialized, and are therefore of limited use to community members and organizations providing community-based health services. Developing relevant, accessible, and usable GIS and health data maps for communities and local agencies is an important step towards enabling individuals and communities to improve their health and increase their control over it. The final map was prepared by overlaying all the layers generated. The spatial objects were digitized out of LISS and PAN merged data and topohsheet supplied by Survey of India respectively and NATMO. Questionnaires were prepared to get the data needed from each hospital and house by field investigation. Finally, a map of Public Health Care Information System was created by interlinking all topographical features with attribute data of the town so as to keep this information for planning and development in days to come.

Keyword: Public Health Care System, GIS, GPS

GEOSPATIAL APPLICATIONS IN RECENT TRENDS

Sundarbans Mangrove trend analysis using Global Landcover products of Sentinel-2

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Abstract:

Minted the land resource dynamics of the last five years (2017- 2021). The last five consecutive years were studied in this research to focus on land resource transformations. The global land cover products of high resolution near real-time of Sentinel -2 10m LU/LC maps were acquired and processed. The map is derived from ESA Sentinel-2 imagery and is a composite of land use/land cover predictions for nine classes each year from 2017-2021. The results exhibit a 1.2 % decrease in mangrove areas (open and dense forests together), i.e., around 68.9 km², from 2017-2021. Over the last five years, there was around a 2% increase in the build-up areas. The decrease in dense forest was at its maximum during 2018-2019 (182.3 km²). The open forests degrade over time as compared to the dense forests. Around 102 km² of mangroves were lost and 82.3 km² in the SBR, corresponding to average losses and gains of 5.7 km²/year and 4.8 km²/year, respectively. The high-resolution Sentinel data is more efficient than other LULC products in documenting the global land use and land cover map. The data is readily available with high accuracy and are cost-free. This product will benefit local, regional, and global government policymakers, urban planners, and environmentalists.

Keywords: Land Use, Sentinel-2, Mangroves, Sundarbans.

Assessing Carbon Stock Shifts and Environmental Consequences: Replacing Sal Forests with Exotic Plantations in West Bengal's Jangal Mahal Region.

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Abstract:

Forests play an important role in the global carbon cycle, serving as both carbon sources and sinks. In recent decades, the Jangal Mahal region of West Bengal, India, has seen major changes in forest cover and composition, affecting biomass output and carbon storage potential. This research looks at the effects of replacing native Sal forests with Eucalyptus and Acacia plantations, focusing on carbon stock dynamics and the environmental consequences. Sal forests, which are recognized for their significant carbon storing capacity, are facing ecological difficulties as a result of the invasion of non-native species, requiring a reevaluation of the carbon balance. We used an integrated strategy that included remote sensing, GIS tools, and on-site observations to analyze the impact of these changes. Free C-band Sentinel-1 microwave data allowed for more precise estimations of forest biomass cover, which improved our knowledge of the terrain. Key characteristics such as tree density, diameter at breast height (DBH), and tree height were included into ground-based data obtained from 40 plots, each measuring 30 meters by 30 meters within distinct forest cover zones. The findings show that as Sal forests are replaced by Eucalyptus and Acacia plantations, carbon storage decreases significantly. Sal forests had an average carbon content of 150 tonnes per hectare, but Eucalyptus and Acacia plantations only had an average carbon content of 85 tonnes per hectare. This decrease in carbon reserves is statistically significant ($p < 0.05$), emphasizing the seriousness of the issue for the environment. These findings highlight the critical need for integrated forest management systems that balance commercial interests in wood production with ecosystem service maintenance and carbon sequestration.

Keywords: Carbon sequestration; Ecological impact; Environmental consequences; Ecosystem services; Forest biomass

Forest Health Assessment Through Geospatial Technology

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Abstract:

Forest health is a driving factor of an ecosystem, and the phenomenon of ongoing climate change is directly and indirectly dependent on it. Forest health is principally monitored by sustainable biodiversity on the earth surface along with socioeconomic development and better livelihood particularly in the rural areas is a major problem in our terrestrial ecosystem, and it has been widely discussed among the several research groups of people. Forest areas are mainly distressed by deforestation, basically by a transformation of forestland into farmland and for other commercial purposes. Therefore in this perspective, assessment and regular monitoring of the forest health are Necessary. Here, we have chosen Buxa reserve forest (BRF) as a study area to analyze the forest health in terms of its vegetation status. They should take proper forest management strategies for a sustainable development of biodiversity.

Climate Resilience Adaptation Strategies for Agronomic Cropping Systems in West Bengal, India

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Abstract:

This case study examines the adaptation strategies to climatic variability within the red and laterite zone of West Bengal, specifically focusing on the intersection of climate change and agronomic cropping systems. The region's susceptibility to climatic shifts poses challenges to traditional agricultural practices, necessitating adaptive measures for sustainable farming. West Bengal's red and laterite zone faces distinct challenges due to erratic rainfall, temperature fluctuations, and changing climatic patterns, impacting crop productivity and livelihoods. This study delves into the innovative adaptation strategies adopted by local farmers and agricultural practitioners to mitigate the adverse effects of climate change on cropping systems. By conducting a comprehensive analysis of agronomic practices, water management techniques, soil conservation methods, and crop diversification initiatives, this study aims to highlight successful adaptation measures. It explores the integration of traditional knowledge with modern agricultural techniques as a means to enhance resilience and productivity in the face of climatic variability.

Furthermore, this case study investigates the role of government policies, technological interventions, and community engagement in supporting and amplifying adaptive practices within the agricultural sector. It emphasizes the importance of knowledge exchange platforms and capacity-building initiatives to facilitate the adoption of climate-resilient practices among farmers. The findings of this study not only contribute to the understanding of climate change's impact on agronomic systems but also provide valuable insights into effective adaptation strategies. These insights can guide policy formulation, agricultural extension services, and sustainable development interventions aimed at enhancing climate resilience in the red and laterite zone of West Bengal.

Keywords: adaptation strategies, climatic variability, community engagement, sustainable farming.

Geospatial Science for Tourism Spot identification & Appraisements of Socio-Economic Condition case study of Belpahari block in Jhargram District

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Abstract:

Tourism has become a thriving global industry and it has become the fourth largest Industry in the global economy. Development of tourism is no doubt a major concern of many Developing countries today including ours. Tourism in India has become one of the major sectors of the economy, contributing to a large proportion of the National income and generating huge employment opportunities. It has become the fastest growing service industry with great potentials for its further expansion and its diversification.

This research proposal is about the social and economic impact of tourism development at Belpahari (Jhargram). Therefore, the objectives of this study are first; to identify location of existing tourism spot and detailing as well as background step. Second; to study of socio economic status Tourism has become a thriving global industry and it has become the fourth largest industry in the global economy. Development of tourism is no doubt a major concern of many developing countries today including ours. Tourism in India has become one of the major sectors of the economy, contributing to a large proportion of the National income and generating huge employment opportunities. It has become the fastest growing service industry with great potentials for its further expansion and its diversification.

The study reveals inadequate government planning, insufficient knowledge and skills of tour operators, and the broader social issues of poverty and its concomitant implications have become the impediments. Despite numerous economic advantages for the government, private businesses and other external organizations, the local villagers do not sufficiently benefit financially from tourism development. The study area is located in the heart of the cultural triangle; villagers and tourists in this region generally demonstrate high levels of sensitivity to indigenous cultures, thus minimizing the negative socio-cultural impacts.

Air Quality assessment through Geospatial Technology

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Abstract:

Air quality is a critical aspect of environmental health, impacting the well-being of ecosystems and human populations. The utilization of geospatial technology has revolutionized the assessment, monitoring, and management of air quality on regional and global scales. This abstract presents an overview of the methodologies, applications, and advancements in leveraging geospatial technology for air quality assessment. Geospatial technology, encompassing remote sensing, Geographic Information Systems (GIS), and spatial analysis techniques, offers a multidimensional approach to assess various air pollutants. Remote sensing satellites equipped with sensors capable of measuring pollutants such as particulate matter, ozone, nitrogen dioxide, sulfur dioxide, and carbon monoxide have enabled the generation of spatially explicit maps depicting pollutant concentrations. These satellite-derived datasets, when integrated with ground-based monitoring networks, provide a comprehensive understanding of air quality dynamics. Furthermore, GIS platforms facilitate the integration of diverse datasets, including land use, meteorological parameters, emission sources, and demographic information, enabling the creation of predictive models and spatial analytics for assessing air quality. The spatiotemporal analysis of air quality parameters aids in identifying pollution hotspots, understanding pollutant dispersion patterns, and assessing the impacts on human health and ecosystems. Advancements in machine learning and artificial intelligence algorithms have enhanced the predictive capabilities of geospatial models, enabling more accurate forecasts of air quality parameters. These models aid policymakers, urban planners, and environmental agencies in developing targeted mitigation strategies and regulatory measures to improve air quality. This abstract also highlights the challenges and future directions in the field, including the need for enhanced sensor technologies, data interoperability, and the integration of emerging geospatial platforms for real-time monitoring. Additionally, the role of citizen science and community engagement in augmenting traditional monitoring networks is emphasized as a valuable approach to gather localized air quality information. In conclusion, the integration of geospatial technology in air quality assessment offers a powerful toolset for understanding the complexities of air pollution. Its multidisciplinary approach provides valuable insights for informed decision-making and effective management strategies aimed at preserving air quality and safeguarding public health and the environment.

Keyword: Geospatial technology, Geographic Information Systems, Pollution hotspots, valuable approach

A Review on screening of Brinjal Genotype under Abiotic and Biotic Stress to develop a Climate Resilient Genotype

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Abstract:

According to Geosciences, vegetable crops have different climatic requirement which is directly associated with crop production. Possible impact of climate change may be visualized by change in productivity with reference to quality of crops, changes in agricultural practices like use of water, fertilizers, and pesticides, and environmental influences particularly in relation to the frequency and intensity of soil drainage which may lead to loss of nitrogen through leaching, soil erosion, and reduction of crop diversity. Due to this geospatial environmental change, mainly two types of stresses are frequently occurring. These are biotic and abiotic stress. Vegetables are in general more sensitive to environmental extremes such as high temperatures and soil moisture stress. CO₂, a major greenhouse gas, influences growth and development as well as incidence of insect pests and diseases of vegetable crops. Higher incidence of disease-pest-weed attack is also another effect of the adverse climate. Under such circumstances, the most important approach to deal with the rapidly altering climate is breeding vegetable crops for development of climate resilient varieties. Pollination and fruit setting may be affected due to this climate change which cause yield loss. The following varieties can be grown in drought prone areas are ASWAD, PICCOLO, RHAPSODY, PING TUNG LONG etc

Keyword: Geosciences, climate, brinjal, stress

A review on evaluation of Tomato cultivars in different mulching technique under red laterite zone of West Bengal

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Abstract:

Tomatoes (*Lycopersicon esculentum* L.) are technically a fruit but generally they are considered a vegetable due to their taste, use in meals, and nutrient content. The productivity of tomato 15.9 MT/ha in all over India. The mulching practice has been done over the past ten years, polyethylene mulch has been used more often in vegetable farming. The benefits of maintaining a suitable soil temperature, weed growth reduction, moisture conservation, and increased agricultural yields have led to its adoption in India. Due to geospatial, effect of environmental effect of biotic and abiotic stress tolerance varieties of tomato are used in different mulching practices. An examination of the growth of tomatoes with organic mulch, control, and inorganic mulches (red, black, and white). When comparing red mulch to black and white plastic mulch as an organic mulch, the result found that the highest values of plant growth and yield as well as soil temperature were seen in the red mulch group. Marketable yield raises for red-coloured, mulched tomatoes, and was surpassed by black- and white-coloured, organically mulched crops above control. According to geosciences, the suitable cultivars of tomato for mulching purpose are PKM-1, S-22, Ratan, BARI-6 etc. It is found that PKM-1 and S22, under different mulching methods (Red, White, Black and Straw), both produced higher yield. In interaction between Black mulch and PKM-1, it is found best result than others (red, straw and white).

Keywords: Geosciences, Tomato, varieties, mulching and climate.

Artificial Intelligence: Breaking a new era along with geo spatial Technology in monitoring Natural Resources

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Abstract:

The relationship between geospatial technology and natural resources is multifaceted and interconnected. Geospatial technology, which includes Geographic Information System (GIS), remote sensing, and Global Positioning System (GPS), helps to understand, manage, and sustainably use natural resources. The spatial data analysis, mapping and visualization, data analysis, collection, tabulation, and monitoring changes in land cover, assessing forest health, and agricultural practices. Satellite imagery and aerial photography, part of remote sensing technology, provide valuable data. The modern use of AI geospatial technology and AI contribute to tracing natural resource management. AI algorithms can analyze vast amounts of geospatial data, such as satellite imagery and GIS layers, to identify patterns, changes in land cover, and potential resource hotspots. AI, especially machine learning (ML), enables the development of predictive models for natural resource availability and distribution. These models can help in forecasting trends, such as predicting deforestation or estimating crop yields. AI algorithms can analyze satellite imagery and automatically detect signs of illegal logging or poaching activities. This helps authorities in monitoring and managing protected areas more effectively. AI-powered camera traps and sensors can be deployed in wildlife habitats. These devices use image recognition to identify and track species, providing valuable data for wildlife conservation efforts. AI can analyze geospatial data to assess the risk of natural disasters, such as floods or wildfires. This information is critical for emergency response planning and resource allocation during crises. AI algorithms can analyze geospatial data collected from geophysical surveys to identify potential energy resource deposits, improving the efficiency of exploration processes. The present paper tries to analysis the present usage of geospatial technology and artificial intelligence in terms of natural resource management.

Keywords: AI, geospatial, ML, models, GIS

Importance and Performance Analysis of Ecosystem Services in the selected wetlands of Murshidabad district, West Bengal

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Abstract:

The functional process of wetlands plays significant role for human wellbeing through ecosystem services. Therefore, the satisfaction of local people regarding importance and performance of ecosystem services can contribute for ecosystem services management. The present study focus to importance and performance analysis of identified ecosystem services in the six selected wetlands- Ahiran lake, Bangsabati lake, Balagachi Damus, Chhatiyani Beel, Chaltiya Beel and Bishnupur Beel of Murshidabad district under Ganga – Bhagirathi River system. Rapid Assessment of Wetland Ecosystem Services (RAWES) method applied for the identification of ecosystem services and importance – performance analysis method was adopted for examining the satisfaction of ecosystem services in the study sites. The importance and performance of ecosystem services can be categorised under four heads like- high importance - high performance, high importance - low performance, low importance - high performance and low importance-low performance. Table result shown that the Ess in Balagachi Damus and Bangsabati Beel have more than 80% of the Ess falling in the Quadrant I. Chaltiya Beel, Ahiran Lake and Bishnupur are the three wetlands were more than 24% of the Ess falling in the Quadrant IV. Chaltiya Beel is the only wetland having nearly 18% of Ess falling Quadrant III group. The study also calculated prioritization level for ecosystem services management in the different wetlands. Ecosystem services like waste disposal, Jute retting, water supply (drinking and bathing), Maintenance of hydrological regimes were high Prioritized. The result was validated with water pollution index and riverine connection to the wetlands.

Application of Remote Sensing in Marine Fishery- A Review

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Abstract:

Marine fisheries play a crucial role in providing substance and livelihood for millions of people worldwide. Remote sensing technology offer a promising solution by providing a comprehensive and real time perspective on marine ecosystem. This paper explores the diverse application of remote sensing in marine fisheries focusing on its contributions to resource assessment, habitat mapping, and fisheries monitoring and also provide a valuable information on fish aggregations, helping fisheries manager to make informed about sustainable catch limits. The utilization of satellite-based sensors, such as Synthetic Aperture Radar (SAR) and multispectral imaging, enables the collection of valuable data on sea surface temperature, chlorophyll concentration, and ocean currents. These parameters serve as indicators of potential fishing zones and aid in the identification of optimal habitats for various marine species. Additionally, the integration of Global Positioning System (GPS) technology with remote sensing data allows for precise tracking of fishing vessels, facilitating effective enforcement of fishing regulations and mitigating illegal, unreported, and unregulated (IUU) fishing practices. This paper reviews recent advancements in remote sensing technologies and their applications in marine fisheries, emphasizing the potential for improved resource management, conservation, and sustainable exploitation of marine ecosystems. The integration of these technologies into existing fisheries management frameworks has the potential to revolutionize the way we monitor and preserve our oceans; invaluable resources.

Key words: Marine Fishery, Remote Sensing, GPS, Radar

Geospatial Applications in Combating Environmental Degradation

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Abstract:

The accelerating pace of environmental degradation has spurred a pressing need for innovative strategies and tools to monitor, manage, and mitigate its effects. Geospatial technology has emerged as a powerful ally in this battle against environmental decline. This paper explores the multifaceted role of geospatial applications in combating environmental degradation across various domains. Geospatial tools, including Geographic Information Systems (GIS), remote sensing, and Global Positioning System (GPS), enable precise mapping and monitoring of ecosystems, natural resources, and human activities. They facilitate comprehensive spatial analysis, aiding in the identification of areas prone to degradation, tracking changes in land use, deforestation, soil erosion, and assessing the impact of climate change. Furthermore, the integration of geospatial data with environmental modeling techniques allows for predictive analysis and scenario planning, offering valuable insights for policymakers, conservationists, and stakeholders. The utilization of these tools enhances decision-making processes, enabling the formulation and implementation of targeted conservation and restoration initiatives. This paper delves into case studies and examples where geospatial technology has played a pivotal role in addressing environmental challenges, such as habitat loss, water resource management, biodiversity conservation, disaster risk reduction, and pollution control. Additionally, it explores the potential of emerging technologies, such as machine learning and artificial intelligence, in advancing geospatial applications for more effective environmental protection strategies. In conclusion, the integration of geospatial applications presents a promising approach to combat environmental degradation by providing actionable insights, fostering informed decision-making, and promoting sustainable management of natural resources. Collaboration among scientists, policymakers, and technologists is crucial to harness the full potential of geospatial technology in safeguarding the environment for future generations.

Keywords: GPS, Geospatial, disaster, decision-making

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