Two Day National Conference

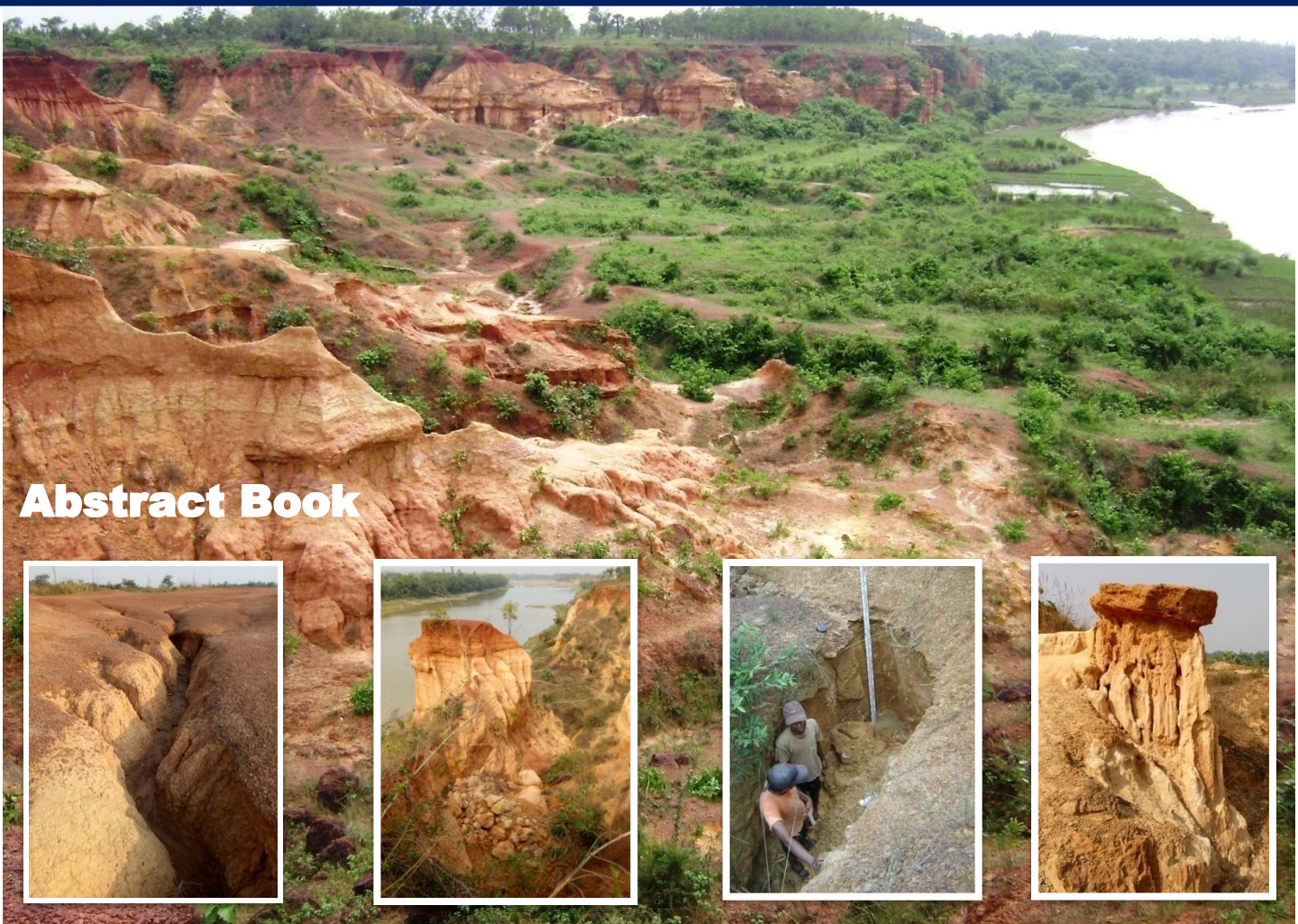## on

Geo-spatial Intelligence for Environmental Hazards and Disaster Management

and

Field Based Workshop at Gangani -Grand Canyon of Bengal

March 05 -06, 2022

Sponsored by

Department of Science & Technology and Biotechnology (DSTBT), Govt. of West Bengal

Abstract Book

Organized by

PG Department of Geography
Raja N. L. Khan Women's College (Autonomous)
Gope Palace, Vidyasagar University
Midnapore-721102, West Bengal

Professor Sibaji Pratim Basu
Vice-Chancellor
Vidyasagar University
Midnapore - 721102

VIDYASAGAR UNIVERSITY

Date: 11.02.2022

M E S S A G E

I am happy to learn that the Post-Graduate Department of Geography, Raja Narendra Lal Khan Women's College (Autonomous) is going to organize a Department of Science & Technology and Biotechnology, Government of West Bengal sponsored Two-day National Conference on *Geo-Spatial Intelligence for Environmental Hazards and Disaster Management* during March 5 – 6, 2022.

I commend this collective endeavour and hope that the deliberations in the Conference will really be enriching to all the participants.

I convey my best wishes for the success of the same.

(Professor Sibaji Pratim Basu)

Dr. Jayasree Laha,
Principal,
Raja Narendra Lal Khan Women's College (Autonomous),
Paschim Medinipur.

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Ref. ....   Date 28-02-2022

Message

I am delighted to know that the Post-Graduate Department of Geography, Raja Narendra Lal Khan Women's College (Autonomous) is organizing Two Day National Conference on "Geo-spatial Intelligence for Environmental Hazards and Disaster Management" sponsored by Department of Science & Technology and Biotechnology, Government of West Bengal in the college premises and also the field based workshop in Gangani, Garbheta, Paschim Medinipur on 05.03.2022 and 06.03.2022 respectively. The topic of the national conference is very much appropriate in the current context and modern society.

I convey my best wishes for the success of the program and thank the member of the organizing committee for their hard work and relentless effort.

Dr. Jayasree Laha

Principal

Raja Narendra Lal Khan Women's College (Autonomous)

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**National Conference
On
Geo-spatial Intelligence for Environmental Hazards and Disaster Management**

ABOUT THE SEMINAR

In the 21st century, more population explosion and anthropogenic pressure are vital problems in the global scale and having reflected crucial effects on our environment. Major factors like industrialization, rapid urbanization, deforestation, land degradation, and land-use patterns enhance the negative impacts associated with natural and social hazards. Multiple natural hazards such as Landslide or mudslide (mudflow), Avalanche, Floods and flash floods, Forest or Wildland Fire, Thunderstorms, Lightning, and Tornadoes, Drought, Tropical cyclones are the most devastating natural disasters causing massive damages to natural and man-made features. Natural hazards are a major threat to human life (injure or death of man and animal life), properties (agricultural area, yield production, building, and homes) and infrastructures (bridges, roads, railways, urban infrastructures). The damage that can occur due to such disaster leads to huge economic loss and bring pathogens into urban environments that cause microbial development and diseases. The natural and social hazards are discontinuing the development of human society and sustainability. Therefore, Natural and social hazards susceptibility mapping (risk assessment), modeling is an essential step for the early warning system, emergency services, prevention and mitigation of future environmental and social hazards and implementation of risk management strategies. Due to the lacking of proper information, technology-based policies and strategies the natural and social hazards are not complementary at a satisfactory level.

Geo-spatial intelligence techniques have enjoyed rising interest in recent decades among the earth environmental and social sciences research communities for their powerful ability to solve and understand various complex problems and develop novel approaches toward sustainable earth and human society.

THEMATIC SECTIONS

Section-I: Geo-physical and Tectonics Hazards: Landslides; Earthquake; Land Subsidence; Volcanic Eruption; Shoreline change; Coastal Hazards; River Bank Erosion etc

Section-II: Hydro-meteorological Hazards: Drought and Agricultural Drought; Floods and flash floods; Thunderstorms; Lightning; Tornadoes and Tropical cyclones; Coastal storm surges etc.

Section-III: Environmental Degradation: Industrialization; Rapid urbanization, Deforestation, land degradation; and land-use patterns; Forest or Wildland Fire; Soil Erosion; Groundwater Depletion; Air pollution; Surface and Groundwater Quality Assessment; Groundwater related hazards etc

Section-IV: Bio-physical and Social Hazards: Crime, Poverty, Visceral leishmaniasis, Dengue fever, Malaria etc

Section-V: Application of Geo-spatial techniques for Natural Resources management; Risk reduction strategy and Planning

ABOUT THE INSTITUTE

Raja Narendra Lal Khan Women's College (Autonomous) was established with the blessings and initiative of the the Chief Minister of West Bengal Dr. Bidhan Chandra Roy in the historical Gope Palace of Midnapore in the year 1957. Gope Palace, during the period of Raja Debendra Lal Khan was an important site of freedom movement and was graced by the footprints of stalwarts like Gandhiji, Netaji and Pandit Jawaharlal Nehru. In the ensuing years, the college has registered significant growth in the areas of teaching and research and presently offers 27 subjects at the undergraduate level and 11 subjects at the postgraduate level. It has been accredited as 'A' Grade by NAAC thrice in 2004, 2011 & 2017 and recognized as College with Potential for Excellence (CPE) by UGC in the year 2011. It is funded by Department of Science and Technology (DST-FIST), Govt. of India and Basic Science Research (BSR), UGC. It has been awarded the status of DBTSTAR College in 2014 by Department of Biotechnology, Govt. of India. Recently this college has been conferred "Autonomous" status from the UGC. From the session 2018-2019 Vidyasagar University has kindly approved two Research Centers in "Natural Science" and "Humanities & Social Sciences" for conducting doctoral research in this college. This college has been selected for "Study in India" programme under MHRD, Govt. of India and international student community has been getting the chance to study in this college.

About the Department of Geography

The department was initiated with the initiation of the college under the affiliation of University of Calcutta in the year 1957 as Economic Geography offering only General Course until 1961. In 1962, Geography Honours achieved its own identity as a distinct discipline at UG level and the proper foundation of the Department came into being. Late Prof. Sabitri Mukherjee was the founder teacher since its inception. This college is one of those few colleges in the state which offered Geography Honours shortly after the independence of the country. The college was affiliated to Calcutta University until 1985 and it got affiliation to Vidyasagar University in 1986. The Department has grown rapidly since its inception and arrived at the present position.

At present the department caring both Under Graduation and Post Graduation course in Geography and also Post Graduation course in Geography under Netaji Subhas Open University (Distance Programme) and Indian Institute of Remote Sensing Distance Learning Certificate Course (IIRS Outreach Programme), Department of Space, Government of India, Dehradun.

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ORGANIZING COMMITTEE

Chairperson: Dr. Jayasree Laha,
Principal, Raja N.L. Khan Women's College (Autonomous)
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Program schedule
NATIONAL CONFERENCE
ON
Geo-spatial Intelligence for Environmental Hazards and Disaster Management

Day	Time	Programme		
Day-1 March 5, 2022	9:00-10:00 am	Registration and Tiffin		
	10:00- 11:00 am	Inauguration Ceremony Welcome Address: Dr. Jayashree Laha, Principal & Chairperson, Raja N L Khan Women's College (Autonomous) About of the National Conference: Dr. Bela Das, Convener of the National Conference Guest of Honour: Shri Amiya Kumar Kalidaha, Sr. Scientific Officer, Department of Science & Technology and Biotechnology, Govt. of West Bengal Chief Guest: Professor Dipendra Nath Das, Dean, School of Social Sciences, Jawaharlal Nehru University, New Delhi		
	11:00 -11:20 am	Lead Lecture-1: Keynote Speaker: Professor Dipendra Nath Das, Dean, School of Social Sciences, Jawaharlal Nehru University, New Delhi		
	11:20 am -11:40 am	Lead Lecture-2: Professor Sunando Bandyopadhyay, Department of Geography, University of Calcutta		
	11:40 am -12:00 noon	Lead Lecture-3: Professor Lakshminarayan Satpati, Director, UGC-HRDC, University of Calcutta		
	12:00 noon -12:20 pm	Lead Lecture-4: Professor Ramkrishna Maiti, Department of Geography, Vidyasagar University		
	12:20 pm -12:40 pm	Lead Lecture-5: Professor Malay Mukhopadhyay, Department of Geography, Visva-Bharati, Santiniketan		
	12:40 pm -1:30 pm	Lunch Break		
		Technical Session-1	Technical Session-2	Technical Session-3
	Venue:	Auditorium Hall	Rabindra Neer	Dept. of Geography
	1:30 pm-1.50 pm	Lead Lecture-6: Professor Biplab Biswas, Department of Geography, The University of Burdwan.	Lead Lecture-9: Professor Sanat Kumar Guchhait, Department of Geography, The University of Burdwan.	Lead Lecture-12: Professor Narayan Chandra Jana, Department of Geography, The University of Burdwan.
	1:50 pm-2.10 pm	Lead Lecture-7: Professor Sujit Mandal, Department of Geography, Diamond Harbour Womena's University	Lead Lecture-10: Professor Nilanjana Das Chatterjee, Department of Geography, Vidyasagar University	Lead Lecture-13: Dr. Pulakesh Das, Scientist, Sustainable Landscapes & Restoration, World Resources Institute India, New Delhi
	2:10 pm-2.30 pm	Lead Lecture-8: Dr. Dipanwita K. Dutta, Department of Remote Sensing & GIS, Vidyasagar University	Lead Lecture-11: Dr. Jatisankar Bandyopadhyay, Department of Remote Sensing & GIS, Vidyasagar University	Poster Presentation
	2.30 pm -5.00 pm	Oral Presentation	Oral Presentation	Oral and Poster Presentation
Day-2 March 6, 2022	9:00 am-1:00 pm	**Field Based Workshop at Gangani Badland**		
		Tiffin		
		Professor Malay Mukhopadhyay, Department of Geography, Visva-Bharati, Santiniketan		
		Professor Ashis Kumar Paul, Department of Geography, Vidyasagar University		
		Professor Soumendu Chatterjee, Department of Geography, Presidency University		
		Dr. Biswajit Bera, Department of Geography, Sidho-Kanho-Birsha University		
		Dr. Priyank P. Patel, Department of Geography, Presidency University		
		Dr. Aznarul Islam, Department of Geography, Aliah University		
	1:00 pm-2:00 pm	Lunch Break		
	2:00 pm-3:00 pm	Valedictory sessions		
		Vote of Thanks		

Organized by Postgraduate Department of Geography
Raja N. L. Khan Women's College (Autonomous)

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Professor Dipendra Nath Das
Dean, School of Social Sciences,
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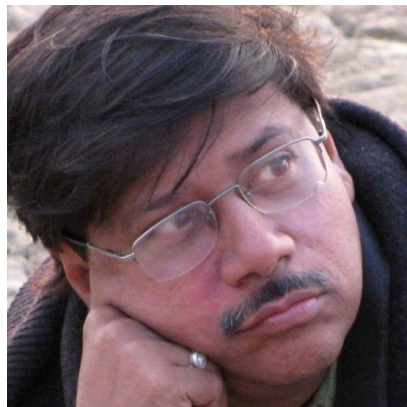
Professor Sunando Bandopadhyay
Department of Geography
University of Calcutta, West Bengal

Professor Lakshminarayan Satpati,
Director, UGC-HRDC
University of Calcutta, West Bengal

Professor Lakshminarayan Satpati is presently the Director, UGC-HRDC, and is a Professor at the Department of Geography, University of Calcutta, Kolkata. He has obtained a Ph.D. degree in Geography from the University of Calcutta, Kolkata. He has presented more than 60 research papers and chaired sessions in national and international platforms, of which the 32nd IGU Conference in Cologne, Germany (2012); 8th IAG Conference in Paris, France (2013); and PRSCO-2019 of RSAI, Bangkok, are notable. Besides, he has been invited to deliver lectures in various faculty development programmes of UGC, ICSSR, DST, etc. He has to his credit more than 40 publications in the form of research papers and articles published in reputed national and international journals and books. His research and teaching interests include climatology, geomorphology, hydrology, environment, population & development, quantitative geography and curriculum development in geography. He has edited a book on Climate and Society – a Contemporary Perspective published by the University of Calcutta in 2015. Fourteen scholars have already obtained their Ph.D. degrees under his supervision. He is also mentor to two Postdoctoral Fellows in the Department of Geography at the University of Calcutta. He has successfully completed two UGC-sponsored research projects and organized three national workshops on Climate Science. Prof. Satpati is associated with a large number of academic and professional organizations of teachers, geographers and climate scientists of India. Currently he is the honorary Editor of UGC-recognized peer-reviewed biannual Indian Journal of Landscape Systems and Ecological Studies of Indian Institute of Landscape, Ecology and Ekistics, since 2017.

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Prof. Malay Mukhopadhyay
Professor, Department of Geography
Visva-Bharati, Santiniketan- 731235

Prof. Mukhopadhyay has retired from the department of geography,Visva-Bharati after teaching for more than three decades.Till date 20 Ph.D scholars have attained their degree under his able supervision. He keeps interest in researching and working with the Indigenous people which includes the Onge Tribe, Apatani Tribe, Santhal Tribe, Pahira Tribe. Apart from contributing in various fields of Geography his area of specialisation lies in Tribal Development Planning and River Environment. He has delivered a number of lectures in various countries across the globe.He has authored in more than 30 books which includes contribution not only in the field of geography but also vastly in field of literature. Besides this he is also the editor of various books in significant fields like River, Environment, Natural Hazard and on Rabindranath Tagore. He has trekked five rivers of eastern India from source to confluence namely Tarapheni ,Kopai, Ajay, Mayurakhi along with Thames of England. Lastly Prof. Mukhopadhyay is a Phillumenist by passion and takes pride in accumulating an envying collection of more than 3000 matchboxes from all across the globe.

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Professor Ramkrishna Maiti
Department of Geography
Vidyasagar University

- ➢ Dr. RamkrishnaMaiti presently serves Vidyasagar University in the post of **professor** in the Department of Geography.
- ➢ Before Joining *Vidyasagar University* in **2004**, Dr. Maiti served *Kurseong College* for **one** year and *Darjeeling Govt. College* for **three** years under West Bengal Education Service (WBES). For the last 17 yearsyears he is in Vidyasagar University
- ➢ He completed **Four** Research Projects sponsored by *University Grants Commission* and *Indian council for Social Science Research.*
- ➢ Till now, he has successfully guided **twelve** Ph. D theses and three M Phil theses. **Three phd** theses are under process. Presently **Eight** Ph D. scholars are working under his guidance.
- ➢ Dr. Maiti authored *four text books* which are very popular among Geographers in West Bengal as well as India
- ➢ He coauthored **Six reference books** (**Three** from Springer, **one** from Primus Books, New Delhi, **Two** from LAMBERT Academic Publication, Germany)
- ➢ He **edited one** book
  - *Biodiversity Atlas in Vidyasagar University Campus (2019)* **Vidyasagar University,** Midnapore
- ➢ He published about **85** articles in National and International Journals of reputeincluding reputed publishers like *Elsevier, Springer* and *Taylor and Francis* and **15** articles in Conference proceedings.
- ➢ Prof Maiti delivered more than 140 lectures in national, international platform.
- ➢ He is associated with numbers of Professional Associations like.
  - Indian Science Congress, Kolkata
  - Geographical Society of India, Kolkata
  - Indian Institute of Remote Sensing (IIRS), Dehradun.
  - Institute of Landscape, Ecology and Ekistics (ILEE), Kolkata.
  - Indian Association of Hydrologists (IAH), National Institute of Hydrology, Roorkee.
- ➢ Professor Maiti is attached with large numbers of Universities and Higher Academic Institutes of West Bengal and India in important academic assignments and responsibilities.

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Sanat Kumar Guchhait
Professor
Department of Geography
University of Burdwan
Bardhaman- 713104, India

Sanat Kumar Guchhait is an Applied Geographer with post-graduate and Ph.D. degrees from The University of Burdwan, West Bengal, India. He has published three books and more than 40 research articles in various international and national journals of geography. His principal research field includes social geography, environmental geography and applied geomorphology. Seven research scholars are completed their Ph.D. under his supervision. Currently, he is working as a Professor in the Department of Geography, The University of Burdwan (Barddhaman, West Bengal).

Prof. Narayan Chandra Jana is an Applied Geographer with a Post-Graduate and Doctoral Degrees in Geography, Post-Graduate Degree in Disaster Mitigation, PG Diploma in Sustainable Rural Development and Diploma in Tourism Studies. He has contributed about 100 research papers published in various national and international journals and edited volumes. He has ***authored three books*** entitled (i) The Land: Multifaceted Appraisal and Management (with Prof. N. K. De), (ii) Transformation of Land: Physical Properties and Development Initiatives, (iii) Tsunami in India: Impact Assessment and Mitigation Strategies; ***jointly edited seven books*** entitled (i) Disaster Management and Sustainable

Development: Emerging Issues and Concerns (with Prof. Rajesh Anand and Dr. Sudhir Singh), (ii) Human Resources (with Prof. Sudesh Nangia and Prof. R. B. Bhagat), (iii) West Bengal: Geo-Spatial Issues (Chief Editor), (iv) Resources and Development: Issues and Concerns (with L. Sivaramakrishnan and others) and (v) Population Dynamics in Contemporary South Asia: Health, Education and Migration (with Prof. Anuradha Banerjee and Dr. Vinod Kumar Mishra), (vi) Livelihood Enhancement through Agriculture, Tourism and Health (with Dr. Anju Singh and Prof. R. B. Singh), and (vii) Climate, Environment and Disaster in Developing Countries (withProf. R. B. Singh). Dr. Jana was also actively engaged in post-Doctoral research and teaching in the Centre for the Study of Regional Development, Jawaharlal Nehru University, New Delhi for five years. He was the coordinator (Eastern India) of the *International Geographical Union: Commission on Geography of Commercial Activities* (1992-96). He is the Life Member of 24 academic societies of repute. He was the Vice-President of *National Association of Geographers, India* (NAGI), Delhi (2011-14, 2019-20) and was the Convener of 33rd Indian Geography Congress, 2011; 35th Indian Geographers' Meet, 2013 and XIV IGU-INDIA International Conference, 2020. Dr. Jana was the Deputy Coordinator of UGC-SAP-DRS Programme (2012-17), and was the Coordinator of DST-FIST Programme (2012-13). He is the Member of the Editorial Board of *Indian Journal of Landscape Systems and Ecological Studies*, Kolkata and Member of the Advisory Board of the journal *Earth Surface Review*, Gorakhpur. He was the Secretary of *Institute of Indian Geographers* (2016-19) and Founder Secretary of *Association of Bengal Geographers*. He is also the Editor of newly launched journal *Contemporary Geographer*. He is the Member of PG Board of Studies in Geography in Kazi Nazrul University, Asansol; Bankura University, and Coochbehar Panchanan Barma University, as well as BRS Member in Geography in the University of Gour Banga, Bankura University and Kazi Nazrul University, West Bengal. Dr. Jana visited ***Nepal (1994), Sri Lanka (2012), Bangladesh (2013), Thailand (2013), Russia (2014), China (2016)**, **Japan (2016)***and ***Thailand (2017)***for various academic purposes. He has delivered about100 lectures in Academic Staff College, sponsored seminars/conferences and various academic departments of different universities. He has successfully guided 11 M. Phil and 11 Doctoral dissertations. He has completed one Major Research Project entitled Tribal Livelihood and Sustainable Development in Mayurbhanj, Orissa sponsored by ICSSR and one small research project on Wasteland sponsored by NRDMS of DST. He has also conducted one Research Methodology Course sponsored by ICSSR. His areas of research interest cover Applied Geomorphology, Hazards & Disasters, Environmental Issues, Land Use and Rural Development. Prof. Jana has been nominated as Steering Committee Member in ***IGU Commission on Research Methods in Geography***. Currently Dr. Jana is Professor (Former Head) in the Department of Geography, The University of Burdwan, West Bengal, India.

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Professor Ashis Kumar Paul
Department of Geography,
Vidyasagar University

Dr. Ashis Kumar Paul had done his Ph.D. work in Coastal Geomorphology with the assistance of Marine Science and the Geography Department of Calcutta University and Geology–Geophysics Department of IIT, Kharagpur. Dr. Paul has over 30 years of research experience (24 years in postdoctoral research) in the area of Coastal Studies around the land sea margin of Bay of Bengal. His contribution in coastal geomorphology is highly appreciated in international and national academic field. He has over 85 research papers in national and international journals. Dr. Paul has worked on several research and consultancy projects of national repute. Presently, he has engaged in teaching at Vidyasagar University.

Professor Soumendu Chatterjee
Department of Geography
Presidency University, Kolkata

Professor Soumendu Chatterjee is a Professor and Head of the Department of Geography at Presidency University in Kolkata, India. He has been teaching Geographical Science at the undergraduate and graduate levels for more than twenty years. His primary research interest is in creating scientific models for predicting complex physical and human processes on the Earth's surface. He has more than fifty publications in national and international journals of repute to his credit, and has headed several research projects funded by the University Grants

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Commission (of India), Department of Science & Technology (GoI), Indian Council of Social Science Research (ICSSR) and other respected agencies in India and abroad.

Dr. Nilanjana Das Chatterjee
Professor, Department of Geography,
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Dr. Nilanjana Das Chatterjee Professor and former HOD in the Department of Geography, Vidyasagar University, West Bengal, India. She received her Ph.D. award from Burdwan University in 2009. She is an expert in the field of Bio-geography, Environmental aspects of resource and hazard related Issues, Landscape ecology with special reference to elephant migration and its consequences in forest fringes, Tribal Culture and Women's studies. She has nearly 20 years of experience in research and teaching, and has authored more than 65 national and international research publications along with many prestigious awards. She is one of the twenty women scientists recognized by wildlife Institute of India, Dehradun. She is an enthusiastic IUCN Commission member for CEM. Six research scholars achieved their Ph.D. award and eight students completed their M Phil dissertation under her supervision. She has completed a major project funded by ICSSR, New Delhi. Now she has completed a research programme funded by ICSSR on "A Spatio-Temporal Analysis of Crime against Women in Selected Districts of West Bengal: (1980-2015): A Geospatial Perspective". She is author of the book "Man Elephant Conflict: A case study from forests in West Bengal, India" published from Springer in 2016,co-author of River Sand Mining Modelling and Sustainable Practice The Kangsabati River, India, published from Springer Environmental Science and Engineering Series in 2021 and authoered the book GIS Application for Crime PredictionA Spatio-Temporal Analysis of Crime Against Women in West Bengal, India. Being a devoted teacher her passion is to maintain a good student teacher relationship.

Professor Dr. Sujit Mandal

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Professor Dr. Sujit Mandal has been serving as Professor of Geography and Dean, Faculty of Science at Diamond Harbour Women's University, West Bengal, India. He is the former Professor of University of Gour Banga, West Bengal, India. He has been serving in college and Universities since 2005. Professor Mandal is specialized in *applied geomorphology*, *soil geography*, *environmental hazards and disasters and geospatial technology*. He is the author of more than 70 research articles published from reputed national and international journals. He is the author of several International books published from ***Springer Publishing House.*** He has successfully guided a number of research scholars. Several students are pursuing their Ph.D. programme under his supervision currently.

Dr. Jatisankar Bandyopadhyay

Dr. Jatisankar Bandyopadhyay is currently the Director of Centre for environmental Studies and also Associate Professor and currently Head, Department of Remote Sensing and GIS, Vidyasagar University, West Bengal. He did his M.Sc. in Applied Geology from University of Allahabad, and went on to do his M.Phil. and Ph.D. from School of Environmental Sciences, Jawaharlal Nehru University, New Delhi. His broad area of research includes

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Geology, Earth science, Disaster Management, Environmental Impact Assessment (EIA), Environmental Studies, and application of Remote Sensing and GIS modelling. He has supervised nine (awarded),six (ongoing) Ph.D. scholars, two M.Phil. Students(awarded) and more than one hundred and sixtyM.Sc. students for dissertation work. He has published more than one hundred and sixteen articles and book chapters in the reputed national and international journals and edited book volume. He has presented papers in more than forty four national and international conferences. He has participated in forty workshop and fifteen webinars. He has received three best paper awards. He has completed six projects and is engaged with one ongoing project as Principal Investigator with INCOIS Govt. of India. He is a reviewer of many international journals and member of INCOIS, SAC-ISRO, INCA, ISRS, and many other reputed Government organizations. He promotes a stimulating environment for continuous learning and research development with his vast teaching and research experience of over 28 years, excellent administrative and leadership skills.

Dipanwita Dutta has been working as an Assistant Professor in the Department of Remote Sensing and Geographic Information Systems, Vidyasagar University, Medinipur, West Bengal, India, since October 2012. She completed her MSc in Geography from the University of Calcutta, Kolkata, West Bengal, India, in 2006 and obtained her second MSc degree in Remote Sensing and Geographic Information Systems under a joint collaboration program of the International Institute for Geo-Information Science and Earth Observation, the University of Twente (The Netherlands), and the Indian Institute of Remote Sensing, Dehradun (India) in 2010. She started her career as a senior research fellow at the Indian Agricultural Research Institute, Pusa, New Delhi. She received her PhD degree from Jamia Millia Islamia, New Delhi in collaboration with the Indian Institute of Technology, Kharagpur, India in 2016. Her broad area of research includes agricultural drought, dryland issues, crop monitoring, land use dynamics, and urban green space, and her research projects have been funded by the University Grants Commission, Department of Science and Technology, Science and Engineering Research Board (Government of India). She has
published more than 31 articles and book chapters in reputed international journals and edited book volumes. She is a reviewer of many national and international journals. She was awarded a NUFFIC fellowship for 3 months staying at the International Institute for Geo-Information Science and Earth Observation, The Netherlands, as part of her MSc course. She has been awarded an International Travel Grant by the Department of Science and Technology, Government of India, for visiting the University of Salzburg, Austria. She has also been awarded a World Meteorological Organization-International Centre for Theoretical

Physics fellowship for attending an international workshop at the International Centre for Theoretical Physics, Italy.

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Dr Pulakesh Das works with the Sustainable Landscapes and Restoration (SLR) program at World Resources Institute India (WRI India). He holds a PhD degree from the Indian Institute of Technology (IIT) Kharagpur, Graduation in Physics and Post-graduation in Remote Sensing & GIS from Vidyasagar University. He has more than nine years of experience in analyzing and integrating various satellite, remote sensing and collateral geospatial data using geo-statistical and machine learning approaches. His research interest includes advanced forest and tree cover mapping using various machine learning techniques, land use land cover (LULC) modelling, landscape restoration planning and interventions monitoring using geospatial approaches, shifting cultivation monitoring, spatial ecology, climate change, hydrology, etc.

He has taught for two years (2017-19) as an Assistant Professor in the Department of Remote Sensing and GIS at Vidyasagar University, West Bengal. Dr Das worked as a Research Fellow in several national and international research projects at the Indian Institute of Technology (IIT) Kharagpur. To date, published 19 research articles in various peer-reviewed journals and 15 book chapters and edited three books.

Dr. Priyank Pravin Patel
Assistant Professor of Geography at Presidency University, Kolkata

Priyank Pravin Patel is an Assistant Professor of Geography at Presidency University, Kolkata, India. His PhD was on the terrain analysis of river basins for sustainable development planning. His interests within Geography reside primarily in fluvial geomorphology, geotectonics, geoinformatics, analysis of cultural landscapes and artefacts and the mapping of urban landscapes.

Few lines about the talk
I will discuss in brief the morphology of the gully fields that have developed in Gangani, highlighting the contrasting nature of the gully basins that have formed in its western (younger and smaller with more marked relief features) and eastern part (older and larger with more subdued relief). I shall also talk about the effect that the layers of varying hardness have on the developed stream profiles, demonstrating how these can be quantified using a RockSchmidt Hammer.

Dr. Biswajit Bera
Assistant Professor in the Department of Geography
Sidho Kanho Birsha University, West Bengal (India)

Dr. Biswajit Bera is an Assistant Professor in the Department of Geography, Sidho Kanho Birsha University, West Bengal (India). He did M.Sc and Ph.D from University of Calcutta, West Bengal (India). He has done P.G. Certificate course in ground water hydrology from IISWBM, Kolkata. He has a rich experience of teaching in different core areas of Geography in various Colleges and Universities over the last 10 years. He is the recipient of prestigious Young Geomorphologist Award and International Young Geomorphologist scholarship. Dr. Bera has published five books for school, college and university students and several research articles in both National and International peer reviewed journals. His research interests include fluvial Geomorphology, Hydrology and Environmental Geography. Dr. Bera regularly appears in debate/talk in both National print and electronic media. Recently, he has completed the ICSSR Major research Project awarded by Ministry of HRD, Govt. of India.

Dr. Aznarul Islam
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Dr. Aznarul Islam is an Assistant Professor in the Department of Geography, Aliah University, Kolkata, India. He did Master of Science in Geography from Kalyani University, India and M.Phil and PhD in Geography from the University of Burdwan, India. He has already published more than twenty five research papers in different national and international journals, edited volumes and conference proceedings. He is an editorial board member of five international journals and also acting as the reviewer of eight international journals. He is an editor of '*Neo-Thinking on Ganges Brahmaputra Basin Geomorphology*', Springer International Publishing and '*Quaternary Geomorphology in India - Case Studies from the Lower Ganga Basin*' Springer International Publishing. His principal area of research include geomorphology of Bengal basin especially river bank erosion, channel migration, flood, anthropo-geomorphology and channel decaying.

Envisioning Disaster Management: An Avenue of Rethinking Environmental Policies

Prof. Malay Mukhopadhyay (Retired)

Abstract

"Disaster is the gap between human aspiration and knowledge support" ---------instances from all over the globe strengthens the claim of the above statement. Disasters have been affecting humans and their livelihood since the very inception of humankind, but in the last few decades their frequency and intensity has increased manifold, causing huge losses of human life and material wealth.Scientific study points out that the impact of these disasters is high,especially in the vulnerable habitats where short term developmental programs conducted, without considering the impact on the environment, is finally seen to lead to disasters. Insatiable human needs finally take the shape of development plans, which without proper knowledge support does irreparable damage to the environment. The author would like to cite few examples from his field study all over the world to throw light on the root causes behind the emerging disasters. Besides this, the author would also like to draw attention on another aspect of ongoing activities which is changing the original landscape of the earth and is disrupting the system dynamism thereby contributing to disaster due to anthropogenic causes in the long run.There exists a huge gap between the scientific communities and policy makers in form of less interaction through common sharing platform.The academicians have a big role to play in achieving the broader aim of holistic development through assessing the feasibility and ground reality of the development goals by providing scientific knowledge on the areas concerned.Moreover, the knowledge of the indigenous communities holdsa lot of potential in reducing the risk of the disasters. Resorting to traditional ecological knowledge of the locals, consideration of deep ecology and pagan culture can contribute significantly towards saving human lives and property from the ill effects of disaster.

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Hazard: Interface between Nature and Society

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Abstract

Hazards are usually considered as the natural phenomena and the impacts are taken to be proportional to the intensity and magnitude of it. Recent experiences show that hazard is more social than it was understood before. Disaster impacts depend on level of economic development, capacity of adjustment and resilience. Disaster affects rich and poor differently. Since 1971, almost 97% of all casualties out of disaster are reported from developing countries. Proper management of disaster requires balanced importance on both natural and social dimensions.

Key words: *Disaster, Intensity and magnitude, social dimension, resilience*

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Riverine process inducing hazardous social space: reflection from the middle reach of the river Bhagirathi

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Abstract

Location and physical proesss are the important consideration in analysing social space from geographical perspective. Present investigation is a reflection of riverine process inducing hazardous social space due to river bank erosion and meander cut off along the middle reach of the river Bhagirathi. People residing in the erosion prone side and for the oxbow lake area are facing the hazard and are transformed into marginalized people. Social relation for such people is under stressed and such an identity of marginalization is the essence of this investigation.

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Disaster Management Policy Perspectives

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Abstract

With the declaration of *International Decade for Natural Disaster Reduction* (1990-2000) by UN General Assembly, the disaster management perspectives got momentum all over the world including India. At the international level *Hyogo Framework for Action* (HFA) and *Sendai Framework for Disaster Risk Reduction* came into existence. The HFA is a 10-year plan to make the world safer from natural hazards. It outlines five priorities for action, and offers guiding principles and practical means for achieving disaster resilience. The Sendai Framework for Disaster Risk Reduction 2015-2030 outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks

So far as South Asian perspective is concerned, SAARC Disaster Management Centre (SDMC) was established with the mandate to serve eight Member Countries of South Asian Association for Regional Cooperation (SAARC) by providing policy advice and facilitating capacity building services for effective disaster risk reduction and management in South Asia.

At the national level, Disaster Management Act, 2005 brought revolutionary change in the policy framework on disaster management in India. The Act calls for the establishment of *National Disaster Management Authority* (NDMA), to be responsible for "laying down the policies, plans and guidelines for disaster management" and to ensure "timely and effective response to disaster". The Act also calls for establishing a *National Institute of Disaster Management* with the mandates for Disaster Mitigation at various levels. Under this act, all State Governments are mandated to establish a *State Disaster Management Authority* (SDMA), *District Disaster Management Authority* etc.

Keeping in view the above in backdrop, it may be mentioned that disaster management is considered as the priority area for sustainable development in almost all the countries of the world.

Keywords: Disaster, Management, Policy, Perspective, Sustainable

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Ecological Consequences of Instream Sand Mining in Kangsabati river, West Bengal, India.

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Abstract

For centuries, humans have been using rivers as the natural resource base without understanding the river ecosystem functions and maintain its stability. Rivers are one of the important life sustaining systems for human civilization. Taking into account the ecological goods and services provided by the rivers, the issue of river health is equally a crucial issue now a day's which raise the interest of the researchers to create baseline information in the fields of the geo-hydrology and river ecology through holistic eco-management of rivers. River health depends on physical habitats of the river. The condition or health of river influenced a number of factors such as river ecological status, water quality, hydrology, geomorphology and physical habitat etc. In view of escalating demand for water and sand as a vulnerable natural resource, multidimensional discourses on river basin and watershed management has also been increased. Among the various types of human interventions in river ecosystems, indiscriminate mining of sand and gravel is the most disastrous activity as it threatens the very existence of these systems. Depending on the geologic and geomorphologic setting, the degree of off-site and on-site impacts of sand mining not only changes the physical characteristics of the river basin environments, but also disturbs its closely linked flora, fauna, and human life. Ecological consequence of sand mining is involved mainly three tier habitat (TTH) transformation and degradation, water quality deterioration (WQD) and species diversity of instream biota. Hence, TTH transformation and degradation across the channel bed to bank is an important issue to address ecological consequences of sand quarrying from the river bed. The present research addressed the issue of instream sand mining and its ecological consequences applying habitat suitability index (HSI), water quality index as well as Biodiversity index.

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Geo-spatial intelligence for landslide hazards and risk management in South Sikkim Himalaya, India

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Abstract

Landslide hazard and risk zonation mapping is of immense important for planning and development of mountain areas. The present study is dealt with the preparation of landslide susceptibility zonation map, risk exposures map, and landslide risk zonation map of South Sikkim Himalaya. In the study, fourteen landslide causative factors have been considered and corresponding thematic data layers have also been extracted to prepare landslide susceptibility map of South Sikkim Himalaya using geo-spatial tools. The landslide susceptibility map has been grouped into four zones i.e. sever, high, medium and low. Five landslide vulnerability components such as land use/land cover, population density, number of household, building typology and height were considered to develop risk exposure maps. Then landslide susceptibility map and all risk exposure maps were combined using analytical hierarchy process (AHP) to generate socio-economic risk and structural risk map of South Sikkim Himalaya. Both risk maps were classified into four i.e. severe, high, medium and low risk. In South Sikkim Himalaya near about 40% area is under high risk. Namchi, Mamring, Melli, Jorethang, Manpur and Yangyang are in severe risk zone. Both socio-economic and structural risk maps will play an important role for executing planning and development in South Sikkim Himalaya.

Keywords: Landslide susceptibility and risk, geospatial tools, statistical models, geo-spatial technology, South Sikkim Himalaya.

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Emerging Trends in Geospatial Science

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Abstract

Innovation in Geospatial science is presently starting to swarm all parts of our daily life with a recognizable change in an innovation manner to find a sense of peace with it and comprehend its tremendous potential. Technology is gaining base day by day because of its huge advantage, especially, in terms of time and cost effectiveness. Remote sensing started during 1840s as balloonists took photos of the ground utilizing the recently developed photo-camera. Perhaps the newest platform at the end of the last century was the famed pigeon fleet that operated as a novelty in Europe. The beginning of other types of remote sensing can be outlined to World War II, with the development of radar, sonar, and thermal infrared detection systems. Since the 1960s, sensors have been considered to operate in virtually all of the electromagnetic spectrum. Developments in remote sensing technologies have led to different kinds of data acquisition techniques which are known as panchromatic remote sensing, multispectral remote sensing, hyperspectral remote sensing, microwave Remote Sensing etc. Another development is the Synthetic Aperture Radar (SAR) imaging, in which microwave pulses are transmitted by an antenna towards the Earth surface and scattered back to the sensor.

Remote sensing data are the principal wellspring of geospatial information and contribution to Geographic Information System. The GIS was first recognized as an application of classified geospatial platform in France, 1832. French Geographer, Charles Picquet made a map-based depiction of cholera epidemiology in Paris by representing the 48 districts of Paris with different colour gradients. Advancements of innovation in geospatial science have improved our data acquisition capability in several aspects. Use of automated or semi-automated methods has increasedthe capability to obtain data for a variety of parameters and spheres of the Earth system such as atmosphere, hydrosphere and lithosphere. However, with the spread of the technology in a variety of application areas, the related technologies are constantly evolving and a variety of developments are taking place. Nowadays, deep learning, machine learning and artificial intelligence has been a core component for the spatial analysis in GIS. These tools and algorithms have been applied for the geoprocessing to solve real-time location-based problems. Prediction of algorithms, such as geographically weighted regression, gives us the ability to model the spatially varying relationships.
Today's most common applications of GIS in businesses include spatial planning (31%), decision making (30%), and asset management (23%), found from the survey. The technological advancements in the future, respondents points to cloud technology, real-time data, Internet of Things (IoT), 3D GIS, Web GIS, mobile GIS, Enterprise GIS, GIS customisation and Software Automation, LBS, and UAVs etc. The major trends in the GIS are going to be witnessed as location-based services, penetration of GNSS systems in precision applications, are used extensively across a wide range of applications, including disaster management, mining, transportation, construction and urban planning, among others.

Keywords: *Remote sensing, GIS, Location-based services, Deep learning, Machine learning and Artificial intelligence.*

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Drought Monitoring and Early Warning: An Appraisal through Earth Observation Datasets

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Abstract

The "creeping hazard", drought is a result of very complex interaction of hydrological, meteorological and anthropological factors. Recent climatic changes along with increasing temperature, irregular rainfall play a pivotal role in increasing intensity and frequency of drought.The past couple of decades have experienced increasing frequency of extreme events leading to a worldwide concern on the strategies to combat climate change issues. Increasing frequency and severity of drought and lack of proper risk management system has become a major concern in both developed and developing countries. India, which is predominantly an agrarian country, has faced recurrent drought episodes and loss of agricultural products due to fluctuations of monsoonal rainfall. Failure of monsoon causes serious impact on agricultural yield as well as failure of many sectors related to agro-based economy. The adversity of a drought can only be reduced when the decision makers have on-time or advance information on the occurrence of drought. Unfortunately, the drought early warning and forecasting are paid little attention by the researchers across the world. It is a wellestablished fact that vegetation condition of a particular time has a time lag effect of rainfall. Satellite based vegetation indices are globally accepted as indicator of vegetation health and its interrelationship with rainfall considered as potential input for predicting vegetation condition as well drought. On this background, the present study assesses the potentiality of satellite derived vegetation and meteorological indices to identify drought dynamics, characteristics and develop an early forecast system.

Keywords: Drought dynamics, geospatial techniques, vegetation indices, early forecasting

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# Flood Hazard Mapping using Sentinel-1 SAR Data

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Abstract

The microwave signals can penetrate clouds due to higher wavelengths, wherein the high dielectric constant and smooth water surface allow easy identification of water spread in a microwave image.Such capabilities allow water inundation monitoring when optical images fail to map the water spread areas during monsoon season under cloudy conditions. The Sentinel-1 Synthetic aperture radar (SAR) images freely available in the public domain enabled flood mapping at a high spatial and temporal resolution since 2014. Recurrent floods in the Brahmaputra River causes havoc damage in its flood plain every year, leadingto socio-economic vulnerability. The current study employed the Sentinel-1 SAR data for water inundation mapping in Assamfrom 2015 to2020. Otsu's automatic thresholding method was applied on the Vertically transmitted Vertically received (VV) polarization band Sentinel-1 SAR data to identify the maximum water inundated areas from July to September. We have verified the identified water spread areas with a few ground observations and Sentinel-2 optical data derived normalized difference water index map, which indicated a high mapping accuracy ($\geq 87\%$). All the districts in the floodplain of the Brahmaputra River and three districts in the southern region of Assam experienced six-time flood events during the study period. The Sentinel-1 SAR data,with its five days revisit time, provides capabilities to generate near-real-time water inundation area mapping.The generated map is important for the decision-makers to develop flood controlling measures, mitigation, relief, and rescue planning.

Keywords: Flood mapping; Brahmaputra River; Sentinel-1; Google Earth Engine (GEE)

Water spread areas (Frequency)
- 1
- 2
- 3
- 4
- 5
- 6
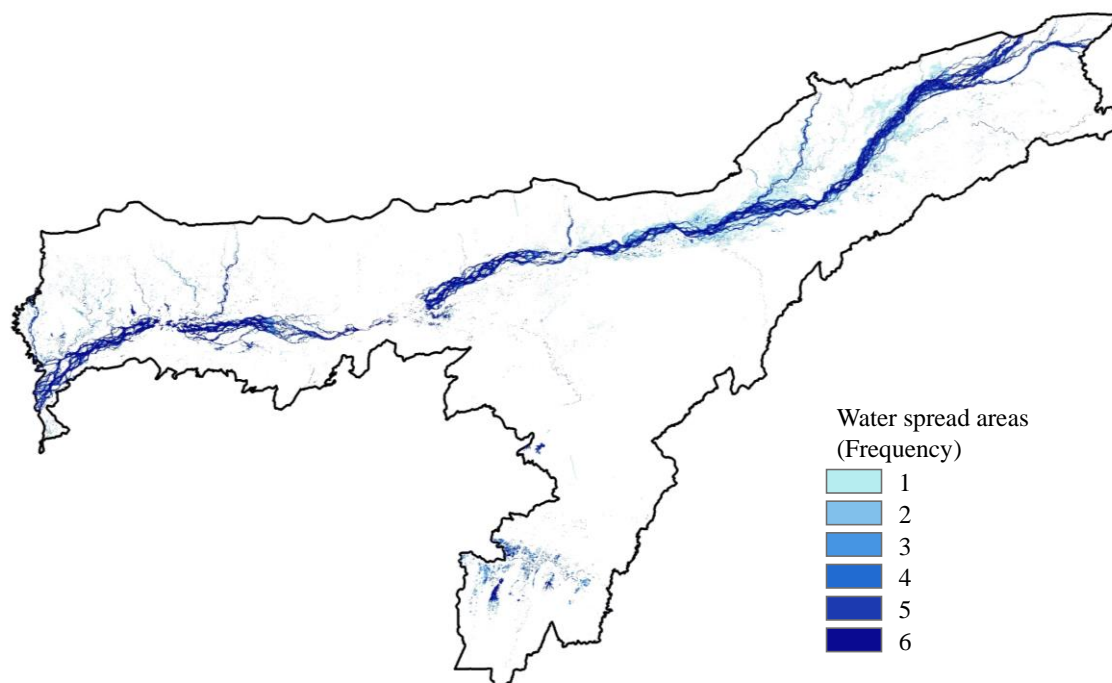
Figure: Waterspread area frequency map generated using the Sentinel-1 SAR data during 2015 – 2020

Figure: Field photographs (a) Hatibatand (b) Notungoan, Assam

[1]

Prediction of river bank erosion-accretion with LULC change using DSAS and CA-Markov models

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ABSTRACT

Erosion-accretion is a significant geomorphological process that involves the channel migration and meandering of an alluvial river channel within its floodplain region. In the present study, we assess the riverbank migration and LULC change pattern of the Kaljani River buffer area of Himalayan foothill region using DSAS and CA-Markov models. This study has demonstrated the application and capability of RS and GIS technology and generated a detailed evaluation of temporal and spatial changes in river channel processes and adjustment of LULC classes. The past and present data analysis reveal that the Kaljani River has changed its bankline positions from extensive erosion-accretion processes and modified its buffer area LULC pattern significantly. During 1998-2008, a very high rate of erosion has taken place along both the banklines, which are about -4.48 m/y (left bank) and -3.48 m/y (right bank), respectively. The overall result of the predicted bankline represents that the bulky expansion will occur along the left bank, and sediment accretion will take place at the right bank. Moreover, the long profile, hypsometric curve value, and the Soil Conservation Service Curve Number (SCS-CN) value have a significant help in understanding and identifying consequence reasons. The accuracy level is validated by the actual bankline positions (2020) with predicted bankline (2020) and actual LULC (2020) to predicted LULC (2020) empirically with RMSE and statistical test. Therefore, the prediction output serves as the spatial guidelines for monitoring future trends of channel shift and land use planning management.

Keywords: Erosion, accretion; DSAS model; CA-Markov model; channel shifting; SCS-CN.

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[2]

Spatial Variation in Solid Waste Management in Midnapore Municipality: A Systematic Study through GIS

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ABSTRACT

Urban landscape is the result of climax phase of the human settlement evolution. The rate of urbanization in the current century is faster and it is expected that, nearly two-thirds of the global population will live in urban by 2050. With this faster urbanization Municipal Solid Waste (MSW) generation rate is much higher and its management emerged as a severe problem. Municipal Solid Waste Management (MSWM) is one of the major challenges and the emerges as a complex issue at present time. It is an important factor towards development of sustainable urban environment, which has to assess and suitably take into account the social and environmental impacts and implementation of specialized treatment and disposal options. Municipal waste management system is much unorganized in India.

Amount of generated MSW waste is directly proportional to the population growth. Quantity and quality of generated MSW and its management depend on socio-economic condition of the residents and landuse pattern of an urban area. Proper management of MSW is possible when we will apply a systematic process, like characterization of the waste, which in turn are related to land use patterns of urban areas. The spatial characterization of waste in urban areas is mandatory for designing a small-scale community-based management strategies, including waste collection, segregation, and disposal.

In this work, we explored the impacts of socioeconomic factors on municipal solid waste generation within the Midnapore Municipality. This study examines spatial distribution of existing waste management system and variation in its composition. For the study, primary and secondary data collection methods were used. It includes spatial assessment of quantity and quality of waste components for various land use classes. In this work, we have designed a spatial representation of solid waste composition with landuse pattern using a geographical information system (GIS). This spatial representation is necessary in designing spatially suitable MSW management strategies within the municipality.

Keywords: Municipal Solid Waste, Socio-economic factor, Spatial pattern, GIS, Waste Quantity and Composition

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Effect of Environmental Stress on Glauconome chinensis, a macrobenthic bivalve in intertidal zone of West Bengal-Odisha Coast, India

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ABSTRACT

Marine-coastal-estuarine-mangrove ecosystem represents the most productive and dynamic ecosystem of the world. The eastern coast of India encompasses a diversified habitat and niche with a large number of faunal components. Glauconome chinensis is an macrobenthic bivalve in the marine to estuarine environment in the intertidal belt of West Bengal-Odisha coast, India. It plays an important role in transitional ecosystems by filtering phytoplankton. It has been recognized as an important link in the transfer of organic matter from mangroves to the third trophic level. Its bioturbatory activities help the juvenile settlement of various faunal components through directly break and transport sediments. Glauconome also oxygenate the bottom by reworking sediments and breaking down organic material before bacterial remineralization. It is an important indicator species that can provide information on environmental health. Now-a-days, coastal ecosystems are constantly threatened by contamination due to human activities, climate change, salinity, transgression, tourism and other anthropogenic activities. All stress affects disease transmission through changing pathogen development, and life cycle whereby the capability for survival may be reduced gradually. The present study helps to diagnose and recognise signs of stress in Glauconome chinensis in coastal ecosystems and may help to maintain the healthy production of that macrobenthic bivalve species.

Keywords: Bivalve, Coastal ecosystems, Environmental stress, Glauconome chinensis

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[4]

The drivers behind trafficking and sex-work: A Case study on Kolkata

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ABSTRACT

In the era of globalisation where violence against women is escalating, trafficking of women for sexual exploitation is also reaching new heights. This research aims to analyse the issues of sex-trafficking and sex-work in Kolkata, through the main objectives:
➢ To examine the socio-economic drivers responsible for sex trafficking and/or entering sex-work.
➢ To understand the quality of life of the trafficked victims post rescue and the sex workers.
➢ To assess social stigma and change in attitude of the main stream society towards these sections.
➢ To study the challenges faced by NGO-'s to combat sex trafficking.

In-depth interviews of trafficked victims and sex workers were conducted through ethics board approved questionnaires. Secondary data sources were also used. The necessary secondary data has been collected from published sources such as, books and journals, articles, government reports, websites, economy survey government of India, socio-economic survey report of India.

To examine the factor relationship regression analysis is used wherever it is necessary. Regression analysis is the most important way to estimate the exact relationship between dependent variable and explanatory variable. The adjusted R2 and F of the estimated regression equation of this model are such that the relevant regression model is fitted to the data set.

It has been found that while, most of the trafficked victims wants to go back home, the sex workers prefer to stay back in Sonagachi owing to food security. These destitutes are highly stigmatised by the members of the main stream society. The research shows the complexities involved in anti-trafficking initiatives and repatriating the victims by the NGO-'s.

Thus, these destitutes should not be perceived as passive victims, but as human agents, who can – and often do – fight to gain control over their lives thus empowering themselves.

Keywords: Trafficking for sexual exploitation, Sex-work, Poverty, Multiple regression analysis, Quality of life

[5]

Juvenile Delinquency and Its determinants: An Analysis across some selected States and Union Territory of India

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ABSTRACT

The term 'Juvenile' comes from two Latin words 'iuvenilis' meaning 'belonging to youth' and from 'iuvenis' meaning 'young person'. The term 'Delinquency' comes from the Latin word 'delinquentia' meaning 'a fault or crime or wrongful or illegal'. Juvenile Delinquency refers to criminal, illegal or anti-social activities undertaken by a child (below the age of 18 years) which violates the law proposed by the constitution. The problem of juvenile delinquency is not new to the society. In India, the Juvenile Justice Act, 2015 has been passed by the parliament. The intention was to change the Indian Juvenile Delinquency Law (I.J.D.L), Juvenile Justice Act (J.J.A), 2000. According to the new law juveniles in the age group of 16-18 years, involved in monstrous or heinous offences, can be tried as adults. It is observed that there is a specific trend between the ages of 16 - 18 years is found to be more involved in monstrous or heinous criminal acts. According to National Crime Record Bureau (NCRB) report in 2020, the incidence of rate of total crime against juveniles is highest in Delhi (44.3%) followed by Chhattisgarh (21.4%), Madhya Pradesh (16.8%), Tamil Nadu (16.4%), Haryana (11.4%), and Maharashtra (11.3%).It is also found that the total crime rate of juveniles of most of all of the nineteen selected states and one union territory except Himachal Pradesh, Rajasthan, Punjab, T.N, Karnataka, Orissa, Chhattisgarh, and Telangana are slightly declining. The family background as per NCRB report near about 75% of the apprehended juveniles lived with their parents, 9% lived with guardians and 16% were homeless. No person is a born criminal. The various circumstance or factors which may be inside or outside or both of the residence of the child play a significant or vital role behind the juvenile's life. The most common determinants or factors which associate with delinquent crimes are lack of proper education, poverty along with other factors like parental ignorance, bad neighbourhood, peer influence, migration, cultural conflict, excess use of internet, frustration due to less available opportunity etc. act as few of the key attributes which lead to the growth of unlawful behaviour in juveniles.

The present study seeks to determine the impact of the determinants on the juvenile crime or delinquency of India across some selected states namely W.B, A.P, MP, UP, Orissa, Kerala, Karnataka, Gujarat, Telengana, J&K, Himachal Pradesh, Assam, Bihar, Punjab, Rajasthan, T.N, Chhattisgarh, Haryana and the union territory Delhi.

The entire study is based on secondary data such as different reports of National Crime Record Bureau (NCRB), journals, books, RBI reports and also census reports. To examine the factor relationship of dependent variable (juvenile delinquency) and explanatory variables (illiteracy, poverty, education above higher secondary level, homeless, living with parents and living with guardian other than parents) multiple regression model is applied.

Key words: *Juvenile delinquency, Determinants, Multiple Regression Model, Indian Penal Code, Special Local Law (SLL).*

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[6]

Impact of Deforestation on Tribal Livelihood: Study on Golapara Forest Edge Village, Purulia, West Bengal.

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ABSTRACT

Forests are the habitat of the tribal villagers and are considered to be the very basis for their sustenance. Purulia is the most backward district in West Bengal. Basic features of the tribal villagers of this district are impoverishment. They basically live in forested hilly areas and plateau areas of the district. They take various types of provisional services from the forest and maintain their livelihood by collecting fuel wood, fodder, NTFP, medicinal plants and small timber for alternative sources of income. But from the last few years they are facing complications in their social and economic life for initiation of deforestation. Deforestation is the purposeful clearing of forested land. From the beginning of time and into current times, woodlands have been flattened to account for farming and animal brushing, and to acquire wood for fuel, assembling, and development. Constant family overview, perception and personal meeting were conducted with an organized survey for information assortment. Result reveals that before deforestation, Sal leave, Medicinal plant, Mahua flowers, the firewood, are the most important NTFPs Constant family overview, perception and up close and personal meeting were finished with an organized survey for information assortment the tribal livelihood. After deforestation circumstance, there have been different issues in gathering and promoting their forest resources. For this result their financial, mental, and physical life becomes tenacious. The present study focuses the changes in livelihood pattern based on NTFP as well as negative impact of deforestation on the tribal villagers of the study areas.

Keywords: Provisioning services, NTFP, Poverty, Deforestation, Tribal, Livelihood.

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[7]

Human Trafficking in India: A Dossier on the State of West Bengal

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ABSTRACT

The present study examines the existing scenario of human trafficking in India with particular reference to the state of West Bengal. The authors have employed the deductive approach to research study that comprises the countrywide to state level course of events. Spatial as well as chronological analyses have been executed in this backdrop. The study is entirely based on the secondary sources of information obtained from an extensive review of related literature and several agencies such as Ministry of Home Affairs – GOI, National Crime Record Bureau, Indian Penal Code and the official website of 'The Wire'. The indicators are – total reported cases, number of persons convicted, child protection service schemes & institutions, cases of women & children trafficking, rate of cognizable crimes, average incidences of various crimes, forms of human trafficking and number of anti-human trafficking units (AHTUs). The study concludes with a timely issue of impact of COVID-19 on the AHTUs in West Bengal. It may cooperate in further works and policy formulation for the researchers and practitioners of various disciplines.

Keywords: *Human trafficking, cognizable crime, AHTUs, deductive approach.*

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[8]

Channel planform changes due to streamflow alteration: the case study of upstream and downstream of Mohanpur anicut, Kangsabati River in West Bengal, India.

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ABSTRACT

According to the river's natural flow paradigm, any disruption from the natural flow condition will alter the river's natural cycle, interfering with transport-deposition processes. River flow regimes have been considerably modified by rainfall variability and further due to anthropogenic activities like dam-induced impoundment and flow diversion which certainly influence the river channel pattern. Due to the fastest increase of world population, then rapidly increasing water consumption, hydropower, and water security have redirected people's attention towards controlling hydrological processes through the construction of river water infrastructure. This concept has serious implications on the present study of Kangsabati River (lower Ganges tributary, India). Due to the construction of new-anicut structure certain part of upstream has submerged and downstream has dried up. This study aims to evaluate the channel planform change due to discharge alteration upstream (~12 km) and downstream (~10 km) of anicut during old and new-anicut periods. To analyze 60 years observed discharge and rainfall data during old-anicut period (1950-2010), and 10 years predicted discharge data during new-anicut period (2011-2020) to show the hydrologic alteration using Mann-Kendall trend analysis, change point analysis, rainfall-discharge correlation, and rainfall-discharge anomaly analysis. Further, planform change analysis was performed through non-water and water area ratio index (NW/W), and active channel width variation by using historical satellite image time-series data (1973-2020) in GIS environment. Results show, old-anicut period mean-annual-rainfall has positive trend and mean-annual-discharge has negative trend. Winter discharge has considerably enhanced but monsoonal discharge has reduced. Before the changepoint of discharge in 1974 all season rainfall-discharge are positively correlated, and most of the years has shown negative-rainfall-anomaly but positive-discharge-anomaly, after the change point in winter and pre-monsoon rainfall and discharge has negatively correlated, and most of the years has shown positive-rainfall-anomaly but negative-discharge-anomaly due to impoundment of Mukutmanipur dam. New-anicut period almost 1204503 cusecs predicted discharge stored by new structure in per-year. On the other hand, during new-anicut period upstream NW/W area ratio has 28% decline, and active channel width has almost 62% increased, in downstream NW/W area ratio has almost 14% incline, and active channel width has 42% decreased than old-anicut period. So, during old-anicut period the discharge was altered by upstream Mukutmanipur dam, there has no direct impact of discharge alteration on planform change, but in new-anicut period the upstream channel has directly impacted by anicut regulation, and downstream channel planform has impacted by both anicut regulation as well as sand mining. Scientifically, the current research will assist the local government in managing human activities on the Kangsabati river in a planned manner.

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[9]

Sacred Groves: Indigenous forest management and answer to the problem of deforestation

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ABSTRACT

Sacred Groves are basically those forest areas that are protected by local communities for religious and cultural beliefs. Tribal or marginal communities do not use the natural resources of these areas out of the fear of dreaded consequences and they also perform various traditional rituals associated with these groves. These fragmented areas represent very few remaining natural vegetation besides forests protected by the governments. These Sacred Groves are very important for preserving cultural histories as well as for the study of the religious belief of various indigenous communities. The size of these groves ranges from very small plots of less than one hectare to larger tracts of land of several hundred hectares. In West Bengal these are known as Gramthan, Harirthan, Sabitrithan, Jahera, Deo Tasara and Mawmund, Sitala, Garam, Manasa, Devimani and Maa Kali are the deities to whom these groves are dedicated. Traditional Tribal Sacred Groves usually do not have any images of deities but votive offerings are made at some trees within the groves. But as a result of Sanskritisation, some Sacred Groves have now images of deities but they are predominantly non Brahmanical. A Sacred Grove is overall an excellent example of an autonomous community effort, initiated by communities for the conservation and management of biological resources and could be encouraged promoted and developed as centres of eco-tourism.

Keywords: *Sacred Groves, community practices, traditional conservation, cultural history, sacred natural sites,*

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[10]

Out-migration and its impacts on children education: a study in Dharsa Gram Panchayat, Jhargram District, West Bengal

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ABSTRACT

Lack of irrigation in the Dharsa Gram panchayat of Jhargram district incapacitates to address recent droughts. This region could not harvest sufficient rainwater due to undulating terrain. Agricultural problems and low crop production have significant effects on rural livelihood and also their children's education. The farmers are being forced to be out of their main occupation. They are looking for alternate occupations to adjust and survive through migration to distant areas. Parental out-migration is having significant impacts on their children's education. Cases of dropout are significantly high among the students whose parents are migrated out. Lack of care sincere effort undermines the quality of education. Semi-structured questionnaire survey was carried out on 125 household and 45 students from seven villages of Dharsa gram panchayat, namely Bara Enyata, Domohani, Kadodiha, Ladhanbani, Astapara, Kukrakhupi and Nera. The surveyed population is stratified according to educational level of parents and their caste. Tribal populations have low levels of education, less land. Their income is not stable compared to others which significantly controls their children's education.

Keyword: Drought, Irrigation, Outmigration, Parental education, Occupation, Children education,

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[11]

Delineation of Groundwater Potential Zone in Paschim Medinipur District, West Bengal, Using Remote sensing, Geographical Information System and Analytical Hierarchy Process

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ABSTRACT

A large amount of global usable water resource is coming from underground and it is replenishing in nature. But in the last couple of decades due to climate variability and modification of land use practice and land cover change along with proliferating demand, the natural aquifer recharge processes have slowed down affecting aquifer depth. Therefore, increasing stress on groundwater resources needs an attention to study about the groundwater potential which deserve further management. Currently, Remote Sensing (RS) and Geographical Information System (GIS) has played a significant role in groundwater studies. Thus, the present study is primarily based on objective to delineate the groundwater potential zone (GWPZ) of the semi-arid dominantly laterite-covered Paschim Medinipur district of Gangetic West Bengal in eastern India, which suffers from ground water scarcity in different part during the summer period in the last few decades. The integrated approach of Remote Sensing, Geographical Information System and Integration of RS and GIS with Analytical Hierarchy Process (AHP), a multi criteria decision support system has been popularly used for identification of GWPZ. A total of nine thematic parameters have been chosen based on the geo-hydrological characteristics of the region. Such thematic parameters, Geomorphology, Geology, Lithology, Land use/Land cover, Soil, Lineament Density, Slope, Drainage Density, and Rainfall were prepared and studied for Groundwater Potential Zone delineation. Weights of each parameter and their sub-classes were assigned through Analytical Hierarchy Process based on their nature and water potential capacity. Consistency ratio was employed to judge the pair-wise comparison of the thematic layer and their sub-class. After assigning the weights of each and every parameter and their sub-class, all thematic map were integrated using weighted overlay method. The obtained output map was cross validating using with the groundwater data of the study area obtained from Central Ground Water Board. The groundwater potential zone map categorized into three classes; Good potential zone is 43%, Moderate potential zone is that 37% and Poor recharge potential zone is 20%, which will support further decision making process for water resource management. The results of this study could be used to formulate an efficient groundwater management plan for the study area so as to ensure sustainable utilization of scarce groundwater resources.

Keywords: Groundwater Potential Zone, Remote Sensing and GIS, Analytical Hierarch Process, Consistency Ratio, Paschim Medinipur.

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[12]

Analysis of Level of Relative Backwardness: Study in the Tribal Villages of Bandgora Gram Panchayet, Jhargram District, West Bengal

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ABSTRACT

Scheduled tribes of Janglemahal, eastern fringe of Chotanagpur plateau region are socio-economically backward and marginalised ethnic groups. The present study aims to represent the geomorphic constraints and relative backwardness among Santal and Sabar community in the study area based on the parameters namely education, occupation, income and monthly consumption. To study the relationship, survey has been conducted based on face-to-face interview method from 80 households from five selected tribal villages of Bandhgora Gram Panchayet in Jhargram district. To identify physical characters of the study area Digital Elevation Model, Soil map, Drainage Map and Land Use Land Cover map have been prepared with the help of Arc GIS 10.8 software. Socio-economic conditions of the area are represented by using some statistical analysis, Engle's ratio, Dimension Index and through diagrammatic representations. The study area is located along the margin of Chotanagpur plateau and shows undulating terrain with infertile lateritic soil. Most of the areas of this region have the problem of water scarcity. Presently this region experiences the problem of deforestation and soil erosion too. These difficult geomorphological and hydrological conditions limit the livelihood opportunity of tribal people. They have to struggle more and more to collect basic needs of life. They find very less opportunity for leisure and recreation and thus attitude toward life is different from that of the mainstream population.

Key words: *Backwardness, Geomorphic constrains and Limited livelihood opportunity*

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[13]

Geospatial Analysis of Coastline in East Midnapore Coastal Tract, West Bengal

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ABSTRACT

Coastal tract is one of the most important zones where four energies viz. wave, tidal, terrestrial and atmospheric agents act together to change coastal morphology as well as coastal morpho-dynamics. Our recent study solely emphasises on geospatial analysis of coastline in East Midnapore coastal tract, which can help to identify morpho dynamics of the coast. To meet the specific objective, geospatial technology has been used. The satellite images i.e. Landsat 4 and 5 TM, Landsat 7 ETM$^+$, Landsat 8 OLI imagery from 1974 to 2020 have been used to detect shoreline change along the coastal tract of East Midnapore. This study incorporates geospatial analysis of coastline using Geographical Information System (GIS) by ArcGIS environment. The result shows dramatic change in coastal morphology as well as spatio-temporal change of coast line along the coastal tract. The study can be helpful for better planning and Integrated Coastal Zone Management (ICZM).

Keywords: Geospatial analysis, Coast line, Geospatial technology, Coastal dynamics

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[14]

Importance of Geo-Spatial Intelligence for Deforestation Management

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ABSTRACT

Deforestation can be defined as the large-scale removal of trees from forests (or other lands) for the facilitation of human activities. Deforestation can involve conversion of forest land to farms, ranches or urban use. Forests combat climate change by absorbing greenhouse gases (such as carbon dioxide) and acting as a carbon storehouse. Forests help mitigate the disastrous effects of floods by acting as a floodwater sink. Deforestation has many causes: Logging, Agricultural Activities, Mining, Desertification of land, Urbanization, Forest Fires.

Forests cover approximately 31% of the total land surface of the Earth. Tropical forests harbour over half of all land-based animal and plant species in the world. Between the years 2000 and 2012, over 568 million acres of forest has been claimed by deforestation. The 2016 report by the FAO reports from 2010 to 2015 there was a worldwide decrease the forest area. During this five-year period, the biggest forest area loss occurred in the tropics, particularly in South America and Africa. Today, the Amazon is facing a multitude of threats as a result of unsustainable economic development; 20% of the Amazon biome has already been lost and the trend will worsen if gone unchecked.

 In 2009, India ranked 10th worldwide in the amount of forest loss, where world annual deforestation is estimated as 13.7 million hectares (34×106 acres) a year. Forest cover is the total geographical area declared as forest by the government. As of 2017, the total forest cover in India is 708,273 Sq km2, which is 21.54 percent of the total geographical area of the country. According to 2019 report, the total forest cover of the country is 7,12,249 sq. km which is 21.67% of the geographical area of the country.

Some of the effects of deforestation are: Deforestation leads to the emission of greenhouse gas, increased soil erosion, Disruption of Water Cycles, Reduced Biodiversity, Climate Change, Leads to floods in some areas.

Government are able to enact ambitious domestic and international forest policies. In 2014, the Food and Agriculture Organization of the United Nation and partners launched Open Foris – a set of open-source software tools that assist countries in gathering, producing and disseminating information on the state of forest resources. GIS can help in effective planning and managing the Deforestation. GIS uses various information layers such as Digital Elevation Model (DEM) and index of flammability along with different models for the purpose of Deforestation. The first satellite recorded forest coverage data for India became available in 1987. India and the United States cooperated in 2001, using Landsat MSS with spatial resolution of 80 metres, to get accurate forest distribution data. India thereafter switched to digital image and advanced satellites with 23 metres resolution and software processing of images to get more refined data on forest quantity and forest quality.

Keywords: *Deforestation, Causes, Effects, Government Policies, GIS.*

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[15]

Assessment of wetlands health risk using RS and GIS techniques

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ABSTRACT

The floodplain wetland played a significant role in the protection of environmental degradation like pollution, lowering groundwater table, natural hazards, and others in Malda District, West Bengal. The functional process of wetlands supports not only for human wellbeing also for other organisms. But anthropogenic activities and health risk factors cause the degradation of wetland health. Thus, it is needed to investigate the risk factors of wetland health and suggest restoration strategies to protect the livelihood patterns dependent on wetlands. The present paper constructs a risk index of wetland health (WRI) in the year 2011 and 2018 using geospatial technology. In this purpose, we have applied pressure-state-response model and analytical hierarchy method. A total number of six Landsat satellite images and statistical census data were used to determine the wetland risk. The WRI values are classified into 5 groups as very low risk (2.81–3.33 low risk (2.41–2.80), moderately risk (2.01–2.40), high risk (1.61–2.00), and very high risk (0–1.60). The results of this study showed that the wetlands located surrounding English Bazar, Manikchak, Ratua-II, and Kaliachak-II blocks have a moderately risk to very low risk condition in 2011 but changed to high risk to very high-risk category in 2018 due to the increase of rapid urbanization, population density, and development activities. It has also found that average wetland health risk value was decreased from 2.14 to 1.93 which is nearly 9.81%. The wetland health risk has increased at a rate of 0.03 per year. Our observation reveals that the ecosystem service value provided by wetlands decreased by 62.51% and 20.46 in the observed period. Management of wetland should emphasize on large (>100 ha) and medium (51–100 ha) sizes of wetlands in the study area. Developing local-level institutions and setting restoration goals are useful strategies to manage wetland resources, and protecting biodiversity being guided by the Government organization and NGOs.

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[16]

A Comparative Analysis of Flood Risk Zonation using MCDM and AHP methods on a flood-affected district of West Bengal

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ABSTRACT

A flood is a devastating natural hazard that may cause damage to the environmental infrastructure and society. Hence, identifying the susceptible areas to flood is an important task for every country to prevent such dangerous consequences. The present study developed a framework for identifying flood-prone areas of the Malda district of West Bengal using geographic information system (GIS), multi-criteria decision-making approach (MCDMA), and Analytic Hierarchy Process (AHP). Different physical-geographical factors (criteria) were integrated and mapped to reach such a goal. Flood Susceptibility (FSZ) and Flood Vulnerability zone (FVZ) have been detected by using the different thematic layers and at last Flood Risk Zone (FRZ) is identified from the last two final output by using Raster Calculator. The ROC curve validated the result which is 0.749 (about 75% accuracy).

Keywords: GIS-RS, AHP, MCDMA, Flood Susceptibility Zone (FSZ), Flood Vulnerability zone (FVZ), Flood Risk Zone (FRZ), AUC-ROC curve

[17]

Air Pollution in Delhi: The Issue of Stubble Burning and Policy Discourse

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ABSTRACT

Every year, Delhi suffers from severe air pollution. People are continually harmed by the dangerous levels of air pollutants present in the atmosphere. Because of pollution, our coughs, thoughts, and actions are all affected on a regular basis. Every year in the winter, Delhi becomes the poster boy for air pollution. In recent years, mainstream academia has emphasized the role of agricultural residue burning in magnifying Delhi's air pollution levels. Given this context, the current study tried to determine the extent to which stubble burning from the surrounding states of Delhi contributes to the deterioration of Delhi's atmosphere. For the period 2000 to 2020, the study employed remotely sensed satellite data to determine the degree of agricultural residue burning. The CPCB provided data on ground-based air pollutants, which was utilized to figure out how much pollution spiked during the stubble burning episodes. Different policy documents are also scrutinized at the policy level to understand the policy making process in air pollution abatement, and a sample survey is employed to understand the farmer's perspective in this direction. The study's findings demonstrated how stubble burning contributes to increased air pollution levels and why farmers are unable to quit burning practices despite repeated interventions.

Keywords: *Air Pollution, Stubble Burning, Farmer's Perception, Delhi, Air pollution control policy*

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[18]

Identification of flood prone areas in lower Keleghai River Basin, West Bengal: a GIS based analysis

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ABSTRACT

Flood is one of the most devastating quasi-natural disasters in India and around the world, which causes severe damages to environment and synthetic structures every year. As landuse changes continue at an unprecedented rate, the damage caused by natural and quasi-natural disaster keeps increasing. To identify maximum extent of flood prone areas of any basin area there have several methods and strategies to adopt. This study incorporates GIS based weighted multi-criteria analysis to determine flood prone areas in lower reach of the Keleghai River basin. To meet the specific objective nine flood contributing factors such as elevation, slope, rainfall, geomorphology, drainage density, distance from river, LULC, stream power index (SPI) and topographic wetness index (TWI) have taken into consideration to integrate in ArcGIS environ by using weighted overlay method and finally flood hazard map have been generated. The result depicts the flood hazard zones viz. severe, high, moderate, low and very low, which can be helpful for better planning to prevent flood damages and management of flood in the study area.

Keywords: *Flood hazard, weighted overlay, GIS, Stream Power Index, Topographic Wetness Index, management of flood*

[19]

Proposing deep learning and machine learning algorithms for soil erosion vulnerability mapping in Pathro River Basin, Jharkhand and Bihar

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ABSTRACT

Vulnerability is generally defined as a population group's failure to respond appropriately to a certain harmful, stressful event. So, soil erosion vulnerability is an essential aspect of watershed development initiative as a part of the sustainable management program on natural resources. This study aims to produce the soil erosion vulnerability map (SEVMs) considering deep learning and machine learning algorithms (MLAs) in Pathro River Basin, India. Twenty-eight, erosion vulnerability determining factors under the categories of exposure, sensitivity, and adaptive capacity were used. Then, four models (i.e., Deep learning neural network (DLNN), Random Forest (RF), Bagging, and Artificial neural network (ANN)) were established for soil erosion vulnerability maps. Along with soil samples were examined using scanning electron microscopy with energy dispersive x-ray analysis (SEM-EDX) to acquire not only the micro-graphic and physical condition of dominant soil forming minerals but also their influences to develop susceptibility of peds to erode. Finally, the receiver operating characteristic curve (ROC), mean-absolute-error (MAE), root-mean-square-error (RMSE), precision, and K-index were utilized for judging the performance of deep learning and machine learning. The obtained results show that the DLNN had the highest performance with an AUC of 0.857, followed by Bagging, RF, and ANN, respectively. All soil erosion vulnerability maps show that the erosion-affected areas are in the upper part of the study area, because this part falls under undulating and rugged topography with high elevation and high slope variation. The final output provides a comprehensive platform for the urgency of policy interventions to minimize erosion risk and ecological damage in prioritized areas of Pathro River Basin.

Keywords: Soil erosion vulnerability; Deep learning neural network; exposure index; adaptive capacity index.

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Nature, Extent and Characteristics of Crime against Women an India: A Socio-Behavioural Analysis

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ABSTRACT

Among the three main aims of the research are the discovery of the various stages and forms of exploitation of women, the examination of the overall violence towards women registered from 2010 to 2020 by state and year and the understanding of the legal and constitutional provisions for female, Indian adjudication and special local ordinances on assaults on women in India. There are three key goals for this study. The Ministry of Home Affairs of India's National Crime Records Bureau provided the statistical data for ten years to support the study. It was found that a wide range of statistical techniques were employed in the research. There was a significant increase in the number of rapes and kidnappings, as well as dowry deaths and other forms of domestic violence perpetrated by husbands and family members. Assaults on women's modesty, such as those perpetrated by a husband or his relatives, are the two most common crimes. The most crimes were committed in West Bengal and Uttar Pradesh. To support women in their efforts to increase awareness about the exploitation of women and the remedies and preventions at their disposal, legislation and revisions to existing laws and constitutions are being introduced to the legislatures around the world.

Keyword: violence; adjudication; kidnappings; remedies; existing laws

[21]

Darkness behind Light -A Case Study of Digha in the perspective of social hazards

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ABSTRACT

Digha is a seaside resort town in the state of West Bengal. It lies in Purba Medinipur district and the northern end of Bay of Bengal. It is the most popular sea resort in the West Bengal. It is mostly famous as a weekend destinations for the people of Kolkata. Though many people of Digha depend on the tourism business but a large part of them (people of Digha) depends upon fishing and fishery industry. However, recently Digha has experienced the preponderance of criminal activities and other antagonistic multiplier consequences including poverty and loss of employment. The renowned tourist hub has been driven within the darkness of hostility and adverse environment. This scenario has become more prominent after the pandemic. The present paper tries to analyse and examine the exact socio-economic situation along with the critical dismantling of various social hazards.

Keywords: Digha, fishing, crime, poverty, pandemic.

[22]

Long term decadal change of land surface temperature in and around Bankura City: A Geospatial Analysis

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ABSTRACT

Land surface temperature(LST) is the radiative surface temperature of the land derived from solar radiation. It measures the emission of thermal radiance from the land surface where the incoming solar energy interacts with and heats the ground, or the surface of the canopy in vegetated areas. Variations of LST has a strong relation with the spatio-temporal changes of land use land cover (LULC) in response to dynamics of population. In this paper, we are trying to identify the decadal changes of LST in and around Bankura city and its relation with LULC and the decadal variation of population. For this study, satellite derived Sentinel 2 MSI imageries with 10m spatial resolution and Landsat 4, 5 and 8 images have been used. For better understanding the relation among the population, LULC change and the decadal variations of LST, we use population data from the census of India. By this work we will able to understand the decadal variation of LST and also be able to find out the interlinkage among the population, LULC and LST in Bankura and its adjoining area.

Keywords: land surface temperature, Land use land cover, Decadal change, Bankura (West Bengal)

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[23]

Repercussion of Storm Surge in Bay of Bengal: Cause, Intensity and Ways of Mitigation

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ABSTRACT

In the recent years, frequent tropical cyclones are hitting the coastal areas of Bay of Bengal. The intensity and the frequency of tropical cyclone is also increasing day by day. The destruction due to storm surge flooding is a serious cause of concern along the coastal countries around Bay of Bengal. Bay of Bengal is affected by maximum number of tropical cyclones on the globe in terms of storm surges and so the maximum impact occurs here. The factors that contribute to the maximum impact of storm surges in the Bay of Bengal are — the phenomenon of recurvature, shallow continental shelf, highest tidal range, the triangular shape at the head of Bay of Bengal and the high density of population especially on low lying islands. The storm surges happen to occur predominantly during the pre and post monsoon period and this is considered because of strong monsoonal winds and intense low-pressure area along the coasts of Bay of Bengal. A total of 162 severe and moderate surges have been reported for the period of 1582-2021 and the number of storm surges have increased during the recent past, but due to timely predictions, warning, growth of infrastructure, that permits mass evacuation has helped sustain life and property.

Keywords: Tropical Cyclone; Storm Surges; Coastal Flooding; Coastal Hazard; Flood Risk; Coastal Salinization.

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Mining Induced Poverty and its Impact on Education in Sonepur-Bazari Open Cast Coal Mining Area, West Bengal

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ABSTRACT

Mining induced displacement is the hearth of several environmental, social and cultural problems and to mitigate the problems monetary, land and job compensation has been given to the project affected villages as well as families but the short term compensation cannot alleviate the long term negative externalities. The loss of 2 Acres of land can compensated with one employment as per the Resettlement and Rehabilitation Policy of Coal India Limited (2012) but rest of the people loss their traditional job as well as other occupational opportunities on which they are accustomed with. Though the sudden influx of money increases the economic level of the project affected people for a short period of time but the poverty level increases after few years of displacement which poses an adverse impact on education in the study area. This study has emphasised on changing nature of educational attainment with changing income level in different communities. Data for this investigation are predominantly derived from semi structured interviews of selected participants from the study area. The interviews have systematically analysed after simulation and it is concluded that the monitory compensation comprehensively contributed to sustained livelihood of project affected families for a short period of time whereas a tiny attention towards changing educational attainment of the project affected communities is a grim reality. Society has been divided into two broad categories by the shake of compensation where one group of people got the opportunity to sent their child to private english medium school on the contrary another group of people forced to discontinue the study of their children to earn money. Poverty forced to belief them that earning money is more important than the education.

Keywords: Open Cast Mine, Displacement, Rehabilitation, Compensation, Educational attainment

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A Discussion on the Geo-spatial, Temporal Contexts of the Outbreak of Pandemic Coronavirus with the Impacts and Mitigation Strategies

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ABSTRACT

Outbreak of Coronavirus has become the most threatening and alarming fact in this decade. It is one of the important biophysical hazards. Because it is created by the geophysical environment and humans being a part of socio-ecological system. World Health Organisation announced the name of COVID-19 to the disease associated with this virus. The name 2019 Novel Coronavirus is given to the Severe Acute Respiratory Syndrome Coronavirus-2. Animals are the original source of the virus although it is transmitted from human to human. It is originated in China and spread all over the world creating great threats to life. As a result, it is said to be 'Pandemic' by the World Health Organisation. The symptoms and modes of transmission are already very much focused by the printed and electronic media and hence it is given least importance. The study concerns the fact of the common risk factors, vulnerability analysis like any hazard. The geospatial distribution of the outbreak of coronavirus needs an analysis because it follows a trend of latitudinal distribution influenced by the climatic parameters. Outbreak of this virus also follows a temporal trend as it is very much dependent on the management factors of any nation. The spread of virus if unchecked at the initial stage due to the country's negligence may give a disastrous effect. Many developed countries are stunted with this threat. However, India being a developing country no doubt needs special attention. Unfortunately, this threat has touched our nation too. India being a crowded nation with minimum medical infrastructure should restrict this crisis through increasing the consciousness related to this life-threatening virus. The measures of management are discussed hereby. A far reaching impact of this virus outbreak in India as well as the World economy and society are also analysed here.

However, some risk reduction strategies should be followed under strict guidelines. There are also some preventive measures to combat the risks and severity of the disease associated with this virus. In this contexts the importance of the anthropogenic processes in catalyzing this disaster like situation are focused in this paper. Management of this crisis period should be started from top to bottom layer of society. Under this panic-stricken conditions, situation should be overcome by following some restrictions. The pre-hazard conditions remain under control than post-hazard stages. So, all the natives must be aware of not to permit this hazard to be transformed into disaster. The management related conditions are highlighted in this paper very carefully to throw a challenge against all the failed developed nations regarding disaster handling techniques and to make the nation successful in mitigating this threat.

Keywords: *Pandemic, vulnerability analysis, risk reduction strategies, disastrous effect, anthropogenic processes.*

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Prioritization of Basin Morphometry through Remote Sensing and GIS techniques in Debnala River sub-basin, Jharkhand

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ABSTRACT

In recent time, Remote Sensing and Geographic Information system becomes vital tools to assess the environmental problems and ensure the overall development of a basin area. These combined tools effectively used to determine the quantitative description of river basin morphometry in a very lucid way. Morphometric analysis of river basin is a vital attempt to know the changing pattern of river and basin characteristics and to understand the problem related to land resource management. In this endeavor, basin morphometric techniques have been applied to understand the nature of soil erosion potentiality. In the present study, Debnala river basin (located in Purba Singbhum District, mainstream length 15.2 km, the basin area is about 103.45 sq.km) in Jharkhand state, a right bank non-perennial tributaries of Dulung River have been selected. It originates in Jharkhand state at an elevation of over 134 meters and flows southeast to cross the border into West Bengal. In the lower course, it has an eastward course, joins with the Dulung at an elevation of about 47 meters. To create the morphometric grid (1sq. km x 1sq. km) over the basin extraction grid wise various morphometric parameter under the linear, areal, relief domains of a basin area along with DEM Configuration have been used. After computing all the parameters of morphometric analysis, a weighted rating has also been incorporated to find the priority of soil detachment rate in the basin area. The result shows that forty (40) sub-basins have a high rate of erosion potential capacity to produce sediment of the Debnala.

Keywords: Remote Sensing and GIS, DEM, Basin Morphometry, Prioritization, Debnala Basin

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Modelling Spatial Gully Erosion Risk Using New Ensemble of Conditional Probability and Index of Entropy in Jainti River Basin of the Chotanagpur Plateau Fringe Area, Eastern India

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ABSTRACT

Gully erosion, in the fringe areas of the Chotanagpur plateau, is one of the severe environmental issues from the perspective of agricultural sustainability, economic framework and land-resource management. The spatial Gully Erosion Risk Map (GERM) can afford to identify the locales sensitive to gully erosion hazard. The present work intends toward modelling spatial gully erosion risk using the new ensemble model in a plateau fringe semi-agricultural watershed of Jainti River (542.69 km2) in Jharkhand, India. Coupling field operation (gully boundary and area measurement) and geostatistical models, the study was accomplished. Field gullies were split into training and validation sets using random partitioning method. Selected predisposing variables for gully erosion based on physical appearances of this basin and literature survey are slope steepness, length-slope factor, soil type, geomorphology, rainfall erosivity, distance from river, stream power index, topographical position index, topographical wetness index, altitude, slope aspect, land use/land cover, normalised difference vegetation index and geology. To prepare the statistical database, information regarding the number of pixel of the individual parameter was extracted using GIS software and for tracing the response of each variable for gully erosion, entropy values were calculated against each of them using IoE. While the probability of gullying within each sub-class of each variable was computed using the CP model. In case of ensemble of CP-IoE, variable weights were assigned through IoE and weights to the subclasses were assigned through CP. The results of CP, IoE and ensemble of CP-IoE quantified 10.58%, 7.73% and 8.25% areas of the basin was under the very high-risk category respectively. Based upon the results of ROC curves, both the prediction and success accuracy of ensemble CP-IoE model with the highest Area Under Curve (AUC= 0.893 and 0.904), showed improved performance in comparison to individual CP and IoE models.

Keywords: Spatial gully erosion; Ensemble model; Success and prediction rate curve; Factor's sensitivity analysis

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Urbanization and its Impact on Drainage System: A Case Study in Bankura City

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ABSTRACT

Bankura city issitu atedinthe interfluent region between Dwarakeswar and Gandheswari rivers. Although the annual rainfall of this district remains around 1400mm,the city-region remains rainless due to its rain-fed location. In past, Bankura recorded a minimum urban population with a very minor rate of urban expansion and during the seasonal rainfall strong and active drainage system srescued this region from the risk of flood and flood-like situation. In recent time Bankura hosts huge urban population in implication with rapid land use changes. Present work is an attempt to find out how farsuch urbanization impacts on local land use and the local drainage system of Bankura city and also to postulate some probable solution for the same. For the study, satellite based imageries in association with population statistics of different time period have been processed in remote sensing and GIS environment. The study shows that rapid unplanned and unwise urban expansion in Bankura urban area breaks down the potentiality of the drainage system and forced to generate flood-like situation, for example, breaking down of a newly build up two stored building at Junbedia, Ward no. 9, of this area by the flash flood on August 5, 2018,at Gandheswari river basin. Due to unplanned growth settlements are encroaching towards the river basin and the river basin going to dieday by day.

Keywords: *Interfluent region, Drainage basin, Flash flood, Urbanization*

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Changing pattern of Ecosystem Service Value of Land Use / Land cover in Barasat Sadar Sub-division of north 24 parganas District

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ABSTRACT

Land use and land cover (LULC) are concomitant with adverse influences on ecological unit perceived at various spatial scales. The shifting arrangement of LULC imitates altering economic and social disorders. The modification in land use/land cover (LULC) can tip to key ecological concerns for instance the soil degradation and dilapidation, contamination of water and biodiversity destruction etc. However, to date, efforts in the quantitative analysis of the impact of LULC change on ESV and the spatio-temoral variability. Present study accentuates the significant association between LULC variations and impact on the function and configuration of ecosystem amenities during last 42 years (1977 – 2019). In this research work, to evaluate the ecosystem service, Xie et al., (2003) estimation method per hectares of the terrestrial ecosystem has been adapted. The ecosystem service (ESV) value of dense vegetation, agricultural fallow, crop land, surface water bodies, and scrubland were calculated per unit area. On a whole, the total ESV value of the wholesub-division were about US $1096.49, $978.64, $926.41, $878.47, $857.57 million in 1977, 1990, 2000, 2010 and 2016 respectively. Results demonstrated that the increasing population pressure and urbanization in the study area is the main reason for the high-level loss of ESV at the expense of dense vegetation and agricultural fallow land. The outcome of the investigation can assist as a reference and basis for enlightening decision building concerning the management of land resources, and subsidize to a trade-off between urban growth and the lessening in ecosystem services.

Keyword: Land use/land cover, Ecosystem Service Value, Barasat Sub-division,

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Urban Drought Chellenge to 2030 Sustainable Development Goals in India

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ABSTRACT

Drought is recognized as one of the most complex natural hazards that have a large negative impact on society, economic sectors and the environment. Drought events affect freshwater resources and can become a great threat to urban water supply systems. According to climate change projections with an increase of air temperature and duration of dry periods, cities may experience a serious water shortage in the future that can limit sustainable urban development

In the first two decades of the 21st century, 79 global big cities have suffered extensively from drought disaster. Meanwhile, climate change has magnified urban drought in both frequency and severity, putting tremendous pressure on a city's water supply. Therefore, tackling the challenges of urban drought is an integral part of achieving the targets set in at least 5 different Sustainable Development Goals (SDGs). Yet, the current literatures on drought have not placed sufficient emphasis on urban drought challenge in achieving the United Nations' 2030 Agenda for Sustainable Development.

This review is intended to fill this knowledge gap by identifying the key concepts behind urban drought in India, including the definition, occurrence, characteristics, formation, and impacts. Then, four sub-categories of urban drought are proposed, including precipitation-induced, runoff-induced, pollution-induced, and demand-induced urban droughts. These sub-categories can support city stakeholders in taking drought mitigation actions and advancing the following SDGs: SDG 6 "Clean water and sanitation", SDG 11 "Sustainable cities and communities", SDG 12 "Responsible production and consumption", SDG 13 "Climate actions", and SDG 15 "Life on land".

Key word: *Urban Drought, Urban Development, Disaster, Sustainable Development Goal, Run-off, Air Temperature.*

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Assessing the Impact of Plastic Enriched Bio-fertilizer on Agricultural Soils Health: A Case Study in Memari II Block, Purba Bardhaman District, West Bengal

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ABSTRACT

Sustainable agriculture consists of not only increasing rate of production, but it also builds and maintains healthy soil. There are three properties of soil viz. physical, chemical and biological which act as indicators of soil health. But now a day with the increasing rate of population and food demands, people forgets about the health of soil and they think that the maximum production could be extracted only by applying maximum percentage of what they have, it may be excessive application of fertilizers, water or intense tillage system. Various practices of agriculture are responsible for declination of soil health. Among the various practices, application of plastic enriched bio-fertilizer and sewage water is significantly harmful for soil health. To Assess this hazardous affects on agricultural soils, Memari II block has been taken as a case study. Many Farmers choose to use plastics enriched household wastes and sewage sludge water in their agricultural lands for betterment of the lands without taking into consideration the harmful consequences. Plastics, especially, microplastics (<5mm) has severely influence the soil bulk density. Consequently, it alters the soil porosity and soil water filled pore spaces. Its long-term effect concealed in the declination of soil health. Adaptive Cluster sampling techniques (after S.K.Thompson, 1992), Grid Method and Handheld GPS have been applied to identify the contaminated sites properly. Visual detection and separation, Sieving and Density Separation (1.20g/cm3 NaCl)   methods have been employed to quantify of macro and microplastics respectively. Core Cutter method has been used to measure soil dry bulk density. Various Statistical techniques have been applied to expound the results scientifically. Increasing of plastic additives in soils is indicating higher bulk density. While with relation to porosity and plastic additives, result shows negative. Plastics additives also reduce the pore space filled with water percentage and respiration as well.

Keywords: Plastic Additives, Soil Bulk Density, Agricultural Soils, Soil Porosity, Pore Spaces Filled with Water, Soil Respiration

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Flood Risk zone identification of Bongaon Sub-division using Ground Based Observation and Remote Sensing & GIS Technology

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ABSTRACT

Flooding phenomenon is deliberated the world's vilest comprehensive risk in terms of scale, existence, geographical extent, forfeiture of life and goods along with dislodgment of people and demographic events. A flood risk map of Bongaon sub-division was generated using multi-criteria decision approach (MCDA) through geographical dataset viz. rainfall, elevation, slope, soil, geomorphology, distance of river to main channel, vegetation vigor, fractional impervious surface, road density, land use/land cover.55 validation points are used to evaluate the flood hazard risk map. The validation result proposes that MCDA and geospatial technology are very influential approaches in flood risk analysis and mapping. The derived flood risk map was reclassified into five categories through manual classification methods in ArcGIS software, such as very low risk, low risk, medium risk, high risk, and very high risk. The flood risk map portrays that probably 74.70 km2 (8.96%) of the area comes under very high flood risk areas. The medium flood risk areas are calculated as 242.02 km2(29.02%), distributed in the central north, north-west and south-west part of the study site. The overall user accuracy and producer accuracy of the flood risk map was calculated as 69% and 72% respectively. Choosing the suitable factors may be useful to planners and developers for future development and land use planning.

Keywords: Flood hazard, Multi-criteria decision approach, GIS, Flood control

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Flood Hazard Management in River Ganga: A Case Study Between Ankin Ghat and Kanpur, India

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ABSTRACT

Physio - geographic and Climatic conditions along with land characteristics makes India one of the most disaster prone countries of the world.Country is exposed to different kinds of natural disasters like cyclones (8%),floods (12%), earthquakes (60%), famines& drought (68%), fire, avalanches and landslides (15%) which are responsible for loss of life and damage to property, affecting overall 85% of Indian land and more than 50 million people. Amongst natural common disasters, flood is one of such calamitywhich is highly recurring event in entire India especially in the study region of Uttar Pradesh.The geographical area of the State is 240.93 lakh hectares and in it about 73.06 lakh hectares is flood prone. Major Riverwhich create flood in the study area is Ganga and its tributaries like IsanNadi,NonNadi, PanduNadi, kalyaniNadi and MadniNadi.In this study region about 126 km2area is flood prone out of 486.00 km2 of the total geographical area. About 91km2 flood area which lies in the left bank side (Hardoi and Unnao dist.) and 35 km2(Kanpur Nagar dist.) in right side become flooded almost in every years. According to the Irrigation Department's estimation, protection from floods could be given to only26 km2 annually in the region.

Flood management both structural and non-structural method, are adopted to mitigate the extent of damage and miseries of the people. The methods adopted for disaster management to be drawn up in conformity with the special feature and topological complexities of the place of occurrence of flood. Situation analysis of a flood are very much essential to increase the awareness in the sense of time, duration, depth, areas of flooding and causes of floods too much obligate in the flood plain dwellers.

Keywords: Flood prone area, Flood Hazard, Awareness, Management Strategy

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An Analysis of Spatial and Temporal Changes of Bhagirathi River Course in Murshidabad District using Remote Sensing & GIS Techniques

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ABSTRACT

An appraisal of the mechanisms and spatio-temporal dynamics river channel course has major importance of river management and in various aspects of environmental protection. Present study was carried out to evaluate Bhagirathi river course migration and dynamic change rate in Murshidabad district on spatial and temporal basis using geospatial methods. Multi-temporal Landsat data were used to evaluate the shifting of channel course during the period between 1977 and 2017. Normalized Difference Water Index (NDWI) is used to extract the river course in the study area. The Bhagirathi river banks and island areas in the Murshidabad district were digitized and saved in personal geo-database. The fixed cross-sections were prepared with allusions to 1977 and 2017 image, in view of the base and up-to-date position of Bhagirathi River. Along with those cross sections, the aloofness between the left and right bank of two consecutive years have been measured. The dynamic index of channel features is used to quantitatively monitor the change in intensity of channel features. The river reach of Bhagirathi river course in Murshidabad district is decreased by 2.23 km2 during the period between 1977 and 2017. The water course area is decreased by 4.36 km2, whereas island and wet sand area increased by 1.40 km2 and 0.73 km2 respectively. It is clear that maximum river course changed in the lower segment. It is also observed that Raghunathganj – I, Lalgola, Bhgawangola – I, Beldanga – I, and II, and Bharatpur – I are the most evident blocks where river course changed frequently during the study period. The period between 1977 and 2017, total shifting area is calculated as 0.87 km2 on the left bank and 1.62 km2 on the right bank. The overall dynamic change rate of the island area is 0.59 km2 from 1977 to 2017 and the relative change is estimated as 1.16 km2. The relative change during this period is estimated as 48.27 km2 and the dynamic change rate is calculated as 123.17 km2. However, the lateral migration of the Bhagirathi River has instigated severe flood problems and economic loss due to damage of arable lands.

Keywords: *Spatio-temporal characteristic, Bhagirathi River, Multi-temporal satellite data, Dynamic change rate*

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Aquaculture-based Water Quality Assessment along the Rasulpur River belt, West Bengal

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ABSTRACT

Intensive aquaculture activity creates negative consequences on surface water quality where proper environmental assessment is neglected specially in the developing nations. The present study has emphasised on the impact of chemicals used for more production on water quality of aquaculture along the Rasulpur River belt, West Bengal. Twenty-four samples of fresh water and brackish water were collected during filed survey in between 2018 to 2019 and tested in laboratory to analyse the physiochemical character such as pH, SO4, F-, AS, DO, BOD of the water of the aquaculture fields. The data regarding the use of pesticides, disinfectants, antibiotics, fertilizers, feed additives and water treated compounds were collected through interviewing method to know the contamination level of aquaculture. The results showed that quality of water in the aquaculture was more contaminated along the river bank due to ample amount of chemical compounds applying for commercial shrimp culture but in case of fresh water aquaculture in the interior part of the study area was less contaminated for the substantial nature of aquaculture. Although, the production of aquaculture was increasing but the practitioners were not concerned about the human health impact and quality of the water. So, there is an urgent need of proper assessment and evaluation regarding these anxieties which have already been taken in the developed nations.

Keywords: Aquaculture, Physiochemical composition, Water quality, Contamination level

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Infant Drive of Chandipur-Erashal Census Town and Its Emergence as the Regional Growth Centre through Rapid Rurbanization

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ABSTRACT

Urbanization is a word for becoming more like a city. Urbanization is a very complex phenomenon which can be explained only by maximum variables with optimum functions. Throughout the developing world there is an insidious march of rural migrants to the major metropolitan areas, resulting in a settlement expansion of unprecedented dimensions. Already the "uncontrolled urbanization" has paralyzed many cities in the developing world, and socio-economically marginal urbanites have found temporary relief in building 'shantytowns'. It is not surprising that many Third World cities are rapidly being transformed into large sprawling shantytowns. Ongoing rapid urbanisation has the potential to improve the well-being of societies. Although only around half the world's people live in cities, they generate more than 80 percent of Global Domestic Product (GDP). Cities are also younger: home to relatively more young and working-age adults than rural areas, making them pivotal places to capture demographic dividends. To form a causal chain, it is right to say that more jobs, more services in the urban side and absence of land in the countryside force people to migrate to larger cities which bring about uncontrolled urbanization. As a result, some problems arise such as unemployment, inadequacy of infrastructure/services and some environmentally unwanted events as well as unpleasant demographic incidents.

Our study area, Chandipur-Erashal census town is reflected as one baby urban centre with its infancy structure whereas it has been declared as one of census towns of Purba Medinipur district in 2011. Now, it has been acted as the development engine to peripheral advancement through rapid rurbanization. The behavioural attitude of it is just like the growth centre to regional development providing the essential goods, services and employment opportunities to the buffer and periphery. The purpose of this paper is to examine the relationship between rurbanization and development through the process of landscape transformation of the selected townscape. This study aims to build understanding about the landscape transformation issues and challenges with the strength, opportunity and weakness (SWOC) of this rurban cum regional growth centre. Since, the journey of the emerging census town is at its infant stage, the smart land use and resource management of this growth centre may be considered for its full flourishment adjusting the human and environmental costs over time. Extensive literature survey, purposive interviewing, crisscross landscape survey, perception survey, sampling data compilation and analysis and spatio-temporal and sectoral mapping by proper GIS and statistical Software, etc have been the ways to reflect the stage and status of this townscape and to make the blue print for its sustainable journey with smart existence influencing regional development.

Keyword: *Rurbanization, Landscape transformation, growth centre, Smart land use, SWOC, Human and environmental costs, Townscape and sustainable journey*

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Integration of CA-Markov Techniques to Generate Future Urban Development Potential Surface on Ghatal Municipality Area (GMA), West Bengal, India

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ABSTRACT

Landscape changes, because it is the expression of dynamic interaction between natural and cultural forces in the environment. Unprecedented market-based urbanization has developed throughout the Ghatal Municipality Area (GMA), West Bengal, India. The prime emphasis of this study is to predict future urban development potential surface using the amalgamation techniques of cellular automata and Markov chain. Therefore, I used four different cloud-free Landsat data from 1990 to 2020 in a 10 years interval. Firstly, maximum likelihood classification algorithm was used to classify the land use/land cover (LULC). Secondly, classified map was used for landscape transformation to denote the changes one individual class to others land classes from 1990-2000, 2000-2010 and 2010-2020. Moreover, the transformational matrix was executed for statistical evaluation. Further, I used Markov chain for the calculation of transitional probability matrix to understand the self-replacement probability of an individual land classes. Finally, cellular automata technique was introduced to predict the future urban growth areas in 2030. The LULC result showed that GMA was experienced rapid urban sprawl throughout the area from 1990 to 2020. The change detection results showed that fallow land, crop land and water bodies was reducing and built-up area was increasing decade after decade. Transitional probability matrix showed that built-up area having self-replacement probability up to 2030. This study concluded that GMA have high potentiality to intensive urban development basically in the form of ribbon, leapfrog and infill development within 2030. This simulated result may helpful for the future spatial allocation and site suitability of urban development especially those lands come under the flood risk zone as per as Ghatal municipal authority concern so far.

Keywords: *Ghatal municipal area (GMA); Market-based urbanization; Cellular automata; Markov chain; Urban sprawl; Urban development potential surface*

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Space- Time Clustering of MalariaCases in MurshidabadDistrict, West Bengal, India

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ABSTRACT

Both Plasmodium vivax and Plasmodium falciparum malaria cases are prevalent in Murshidabad district and its proportion fluctuate across the district. Present study was undertaken to investigate the space-time clustering of malaria epidemic in Murshidabad district of West Bengal, India based on spatial statistical approach. This analysis used longitudinal data collected from the State Health department of Murshidabad district during the period between 2009 and 2016. The directional distribution of the disease pattern was investigated through standard deviation of ellipse. The local spatial auto-correlation was investigated using Local Moran's I statistics. Getis-Ord G statistics (G_i^*) statistics was used to investigate the hotspot and cold spot of the study site. The Moran's I values of total annual incidence rate decreased from 2009 to 2011, then increased until 2013, and dramatically increased afterward. The Moran's I values for P. falciparum malaria were remarkably fluctuant and generally higher than those P. vivaxmalaria. The results showed statistically significant high-low clustering pattern for both the malaria cases in 2012 and 2013. Space time clustering analysis revealed that spatial association of malaria affected blocks were not randomly distributed in the study area, proposing that malaria transmission in one block is directly or indirectly linked with the transmission in adjacent block. This information is helpful to understand the disease circulation pattern for enlightening malaria control intercessions and planning for disease control programme.

Keywords: *Malaria Control, GIS, Spatial auto-correlation, Spatial clustering.*

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Flood Past and Present of Moyna Basin

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ABSTRACT

The present study focuses on the flood conditions of past and present occurring at Moyna basin, creating flood hazard for the inhabitants of the Keleghai and Chandia river basin of West Bengal. The flood hazards affected agricultural activities and the rural settlement in the basin area. In the past flood hazard occurred frequently, but recently flood hazard have been controlled. Present research work aims to find out the change of magnitude of flood hazards, resultant effects, building of resilience capacity of the inhabitants. The work has been carried out by households survey, and consulting secondary sources of data like SOI map, administrative and irrigation maps, GIS technique. The GIS technique plays an important role in areal identification as well as magnitude of past and present flood conditions.

Keywords: Moyna basin, resilience capacity, flood hazards, Keleghai, Chandia.

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Vulnerability Mapping of River Bank Erosion in Coastal Zone of Gosaba Island, Indian Sundarban

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ABSTRACT

Shoreline is one of the most dynamic linear features on the earth surface. The study aims to assess the various aspects of shoreline changes and try to identify the degree of vulnerability of coastal zone influenced by erosion and accretion processes of estuarine rivers. The shorelines were extracted from different multi temporal satellite images (Landsat MSS 1972, Landsat TM 1997, Landsat 8 OLI, 2017) and applied modern techniques along with statistical measures to identify the intensity of vulnerability of river bank erosion. Apart from that, intensive field verification was done to investigate the nature and extent of river bank erosion in various vulnerable sites of the delta. The average shoreline change rate was measured by End Point Rate (EPR) that shows 13.98 and 14.59 meter/decade for 1972-1997 and 1997-2017 respectively. The average Net Shoreline Movement (NSM) from the year 1972 to 2017 is 32.39 meter/decade. Net Areal Change (NAC) was delineated through erosion and accretion mapping for the time period of 1972-2017. The total Area under Erosion (AE) was calculated through the superimposition of vector layers digitized from multi-temporal satellite images. Thereafter, the Gram Panchayat wise intensity of vulnerability was assessed by using the above mentioned four parameters through statistical method of Composite Score (CS). The study reveals that most of the southern part of the delta including Kumirmari Island in the east is more vulnerable due to erosional activities of tidal rivers and creeks whereas northern part is less vulnerable and most stable due to depositional activities of rivers. This study is quite helpful for strategic planning of sustainable coastal zone management in Gosaba Island.

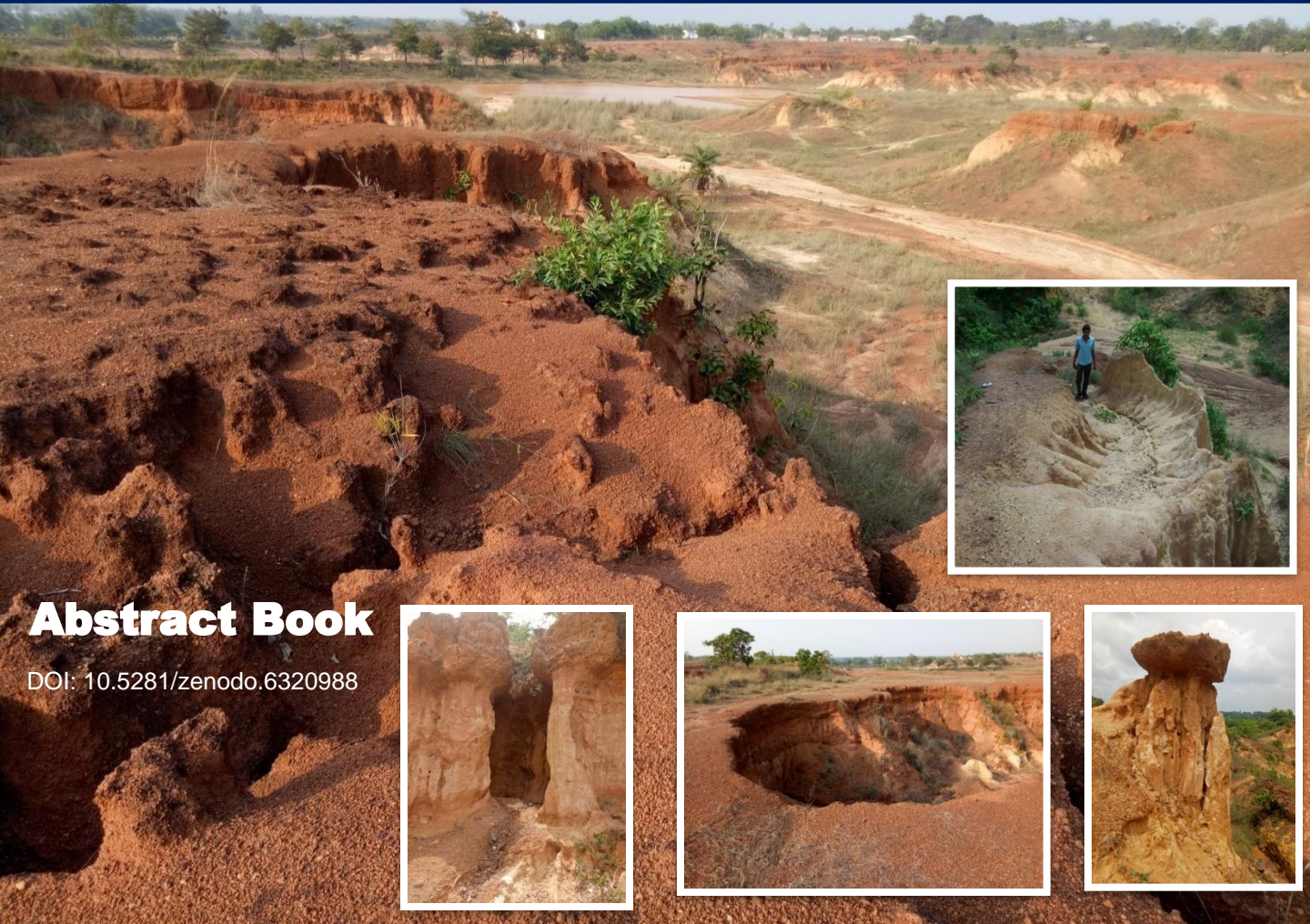***Keywords:*** *End Point Rate, Net Shoreline Movement, Net Areal Change, Erosion and Accretion, Vulnerability assessment*