CENTRE FOR SPACE SCIENCE AND TECHNOLOGY EDUCATION IN ASIA AND THE PACIFIC

(AFFILIATED TO THE UNITED NATIONS)

MEMOIRS

TWENTY EIGHTH POST GRADUATE COURSE IN REMOTE SENSING & GEOGRAPHIC INFORMATION SYSTEM 2024 - 2025

Conducted at

Indian Institute of Remote Sensing (IIRS)

Indian Space Research Organisation

Dehradun, India

CSSTEAP GOVERNING BOARD MEMBERS

India
Chairman, CSSTEAP-GB
Dr. V. Narayanan
Secretary, Department of Space
Antariksh Bhavan
New BEL Road
Bangalore - 560 231

Bangladesh
Mr. Md. Momenul Islam
Director
Bangladesh Meteorological Department
Meteorological Complex, E-24 Agargaon
Dhaka-1207, Bangladesh

DPR Korea
Dr. Hong Yong IL
In Charge of S & T
Embassy of DPR Korea
First Floor, C-17, Lajpat Nagar-III
New Delhi-110024

Indonesia
Prof. Dr. Erna Sri Adiningsih
Research Professor /Executive Director
Indonesian Space Agency (INASA)
Secretariat
National Research and Innovation Agency (BRIN)
Jakarta, Indonesia

Iran
Mr. Arman Pishini
Director General
Center for International Relations & Cooperation
Iranian Space Agency, No. 34- Sayeh Street
Afrigha Boulevard, Tehran, Iran

Kazakhstan
H.E. Mr. Zhalgasbayev Nurlan
Ambassador of Kazakhstan to India
Embassy of Kazakhstan
61 Poorvi Marg, Vasant Vihar
New Delhi-110057

Kyrgyz Republic
Prof. Abdykalykov Akymbek Abdykalykovich
President
International University for Innovation Technologies
720048, Bishkek 1/17, Gorky Street
Kyrgyz Republic 720048

Malaysia
H. E. Dato Muzafar Shah Mustafa
High Commissioner
Malaysia High Commission
50M, Satya Marg, Chankyapuri
New Delhi - 110 021

Mongolia
Prof Budeebazar Avid
Secretary General
Mongolian Academy of Sciences
Mongolian Academy of Sciences (MAS)
Floor 6th, bldg. Soyol Tuv Urguu
A.Amar Gudamj, Sukhbaatar sq.3
Ulaanbaatar -210620A, Mongolia

Myanmar
Dr. Kyi Thwin
Acting Rector,
Myanmar Aerospace Engineering University,
Meiktila, Mandalay Division
Myanmar

Nauru
H.E. Ms. Marlene Inemwin Moses
High Commissioner
High Commission of the Republic of Nauru
A 5/6, Vasant Vihar
New Delhi 110057

Nepal
Mrs. Durapada Sapkota
Minister-Counsellor
Embassy of Nepal
Barha Khamba Road
New Delhi - 110 001.

Philippines
H.E. Mr. Josel F Ignacio
Ambassador of Republic of Philippines
Republic of Philippines
Embassy of Republic of Philippines
50N, Nyaya Marg
Chanakyapuri

Republic of Armenia
Dr. Hayk Abrahamyan
Deputy Director
Byurakan Astrophysical Observatory after V. A. Ambartsumian
National Academy of Sciences of the Republic of Armenia

Republic of Korea
Dr. In Sang Moon
Director, Kari Academy
169-84 Gwahangno, Yuseong-Gu
Daejeon 305 806, Republic of Korea

Sri Lanka
Eng. Dr. S. Panawennage
GB Member from Sri Lanka &
Former Director General & CEO
Arthur C Clarke Institute for Modern Technologies
Katubedda, Moratuwa, Sri Lanka

Thailand
Dr. Pakorn Apaphant
The Executive Director
Geo-Informatics and Space Technology Development Agency
Government Complex,
Building B, 6-7th Floor
120 Moo 3 Chaeng Wattana Road
Lakshi, Bangkok 10210
Bangkok 10900, Thailand

Uzbekistan
Dr. Kamol M. Muminov
GB CSSTEAP Member
Ulugh Beg Astronomical Institute of the Uzbekistan Academy of Sciences
33, Astronomicheskaya Str.,
Tashkent 100052,
Uzbekistan

UN-OOSA
Dr. Aarti Holla-Maini
Director
UN Office for Outer Space Affairs
Vienna International Centre
PO Box 500, A-1400
Vienna, Austria

ITC, The Netherlands
Prof. Dr Freek van der Meer (Observer)
Rector, ITC
Faculty of Geo-information Science and Earth Observation
of the University of Twente
PO Box 217, 7500 AE Enschede
The Netherlands

UNESCAP, Thailand
Ms Tiziana Bonapace (Observer)
Director
Information and Communications Technology and Disaster Risk Reduction Division (IDD)
United Nations Economic and Social Commission for Asia and the Pacific
United Nations Building, Rajadamnern Nok Avenue, Bangkok 10200, Thailand

Secretary
Dr. Raghavendra Pratap Singh
Director, CSSTEAP
Indian Institute of Remote Sensing Campus
PB No.222, No.4, Kalidas Road
Dehradun - 248 001

CENTRE FOR SPACE SCIENCE AND TECHNOLOGY
EDUCATION IN ASIA AND THE PACIFIC (CSSTEAP)
(AFFILIATED TO THE UNITED NATIONS)

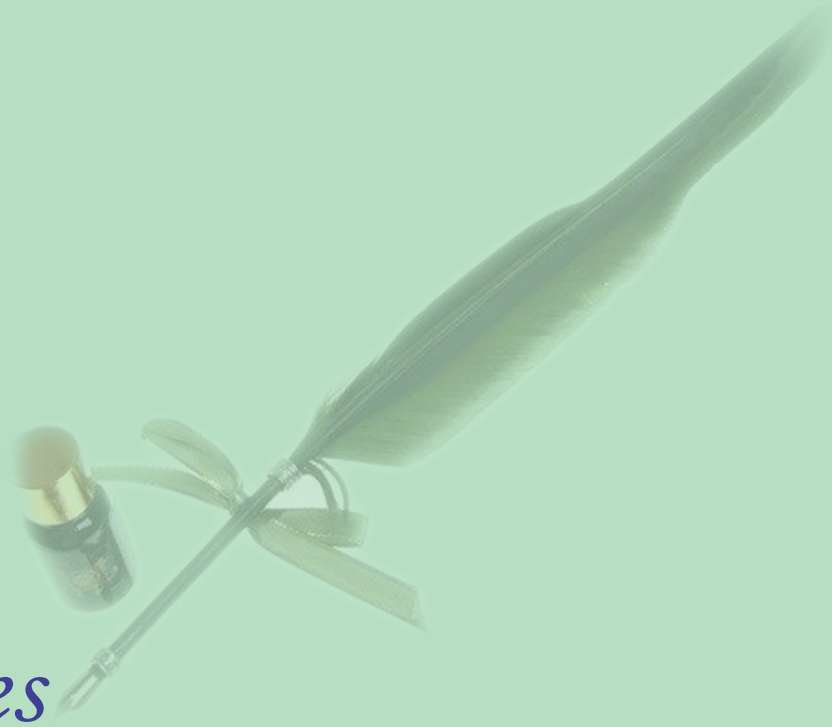
MEMOIRS

TWENTY EIGHTH POST GRADUATE COURSE IN REMOTE SENSING &
GEOGRAPHIC INFORMATION SYSTEM
JULY 01, 2024 TO MARCH 31, 2025

Conducted at

Indian Institute of Remote Sensing (IIRS)
Indian Space Research Organisation (ISRO)
Dehradun, India

CONTENTS



Messages

CSSTEAP Governing Board Members and Special Invitees during the
29th GB Meeting held on December 21, 2024 at New Delhi

डॉ. व. नारायणन
Dr. V. Narayanan

सत्यमेव जयते
भारत सरकार
Government of India

अध्यक्ष, अंतरिक्ष आयोग
व
सचिव, अंतरिक्ष विभाग
Chairman Space Commission
&
Secretary, Department of Space

Message

I am pleased to note the successful completion of the 28th Post Graduate Course in Remote Sensing & Geographic Information System (RS&GIS) of the UN affiliated Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP). I congratulate the 20 participants, from 10 countries across the Asia-Pacific region, graduating this course. I hope the knowledge gained by them during their nine months stay at CSSTEAP will be of immense help in meeting the requirements of space application in their countries.

The RS&GIS course has been a most sought-after course since its inception and till date almost 540 trainees have been benefited from this course. As the demand for space-based solutions grows, CSSTEAP continues to adapt its programs to meet the evolving needs of the region. I am happy to note that the institution is planning to expand its research collaborations, enhance its digital learning capabilities, and develop more specialized courses. I am sure, CSSTEAP will continue to play an integral role in shaping the future of space technology applications in the Asia-Pacific region.

I commend the faculty and staff of Indian Institute of Remote Sensing, Dehradun, the host institute of RS&GIS course and the CSSTEAP, for successfully and efficiently conducting the 28th RS&GIS course.

I wish all the participants continued success in their future endeavors and hope to continue the interactions with each one of you as our brand ambassadors.

Dated : March 14, 2025

(व. नारायणन / V. Narayanan)

अन्तरिक्ष भवन, न्यू बी ई एल रोड, बेंगलूर - 560 094. भार
दूरभाष: +91-80-2341 5241,2217 2333, फैक्स : +91-80-2341 5328, 2351 8551

Antariksh Bhavan, New BEL Road, Bangalore 560 094, India
Telephone: +91-80-2341 5241,2217 2333, Fax: +91-80-2341 5328, 2351 8551,
e-mail: secydos@isro.gov.in / chairman@isro.gov.in

United Nations Nations Unies

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

Message

Dear Colleagues,
I would like to congratulate all of you who successfully completed the twenty-eighth remote sensing and GIS post graduate course at CSSTEAP in Dehradun, India.

I want to thank the Government of India and all professors, teachers and staff at CSSTEAP for their efforts in enhancing the capacity of young professionals from developing countries to use geospatial information for disaster risk reduction and sustainable development.

ESCAP's partnership with the Government of India and CSSTEAP is empowering young professionals to develop innovative space-based solutions for a resilient and sustainable future. With the knowledge and skills acquired through the course, you will be instrumental in developing innovative geospatial solutions to accelerate the achievement of the Sustainable Development Goals in your respective countries.

This collaboration is an example of how ESCAP, through its Regional Programme of Technical Cooperation, is leveraging the funds and expertise of its spacefaring members to inspire youth and increase their involvement in the space sector as part of the broader implementation of the Asia-Pacific Plan of Action on Space Applications for Sustainable Development (2018-2030), the region's blueprint for harnessing space and geospatial applications.

ESCAP is delighted to have officially joined the CSSTEAP Governing Board as an observer in 2024, reflecting our commitment to further strengthen our collaboration with CSSTEAP in the future. We will continue to support young professionals from developing countries, particularly in CSSTEAP's remote sensing and GIS studies.

Tiziana Bonapace
Director
Information and Communications Technology
and Disaster Risk Reduction Division

United Nations Building, Rajadamnern Nok Avenue, Bangkok 10200, Thailand
Tel: (+66 2) 2881456 • Fax: (+66 2) 288 1000 Email: escap-sas@un.org • www.unescap.org

Government of the People's Republic of Bangladesh
Bangladesh Meteorological Department
Meteorological Complex
E-24, Agargaon, Dhaka-1207, Bangladesh

Phone : + 88 02 41025705 / 41025730
Fax : + 88 02 41025726 / 41025727
E-mail : info@bmd.gov.bd
swc@bmd.gov.bd
swcbmd@yahoo.com
Web : www.bmd.gov.bd

Md. Momenul Islam
Director
Bangladesh Meteorological Department
& PR of Bangladesh with WMO
And
CSSTEAP Governing Board Member
E-24, Agargaon, Dhaka-1207, Bangladesh

Message

I am immensely delighted to know that the 28th Course on Remote Sensing and Geographic Information System (RS & GIS) organized by the United Nations Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) at the Indian Institute of Remote Sensing (IIRS) in Dehradun, India has successfully concluded on 31' May 2025. As a part of the CSSTEAP Governing Board (GB), I also worth the fame of the successful conclusion of the said course. Also, would like to extend my profound congratulations to CSSTEAP, Dehradun for the successful arrangement and completion of this course. With more regards, I like to confer thanks and congratulate all the participants on their successful completion of the program. I firmly believe that the 20 participants representing from 10 different countries will have greatly benefitted from this course. They will now be able to utilize their achieved knowledge of RS & GIS in their respective fields of their own countries, especially in the tailored research projects highlighting the needs and application of RS & GIS for better outcomes in the coming days.

I am grateful and would also like to express my sincere thanks to the Government of India and the Department of Space/Indian Space Research Organization for creating this valuable opportunity under their expertise and supervision to the participants from the Asia Pacific Region. I am hopeful that the gain knowledge by the participants through this course will pay crucial role to implement several activities for their countries and will enhance the strong capacity for application of earth observations and geo-information science. I sincerely hope that the Government of India along with other pertinent organizations will continue their efforts to make more fruitful this course in the future.

I wish the success of the participants in their future endeavors and look forward to the contribution of their skill and knowledge for the betterment of their countries.

Finally, all the best wishes for the participants, Director, Resource persons, Scientists and Staff of IIRS, Dehradun, India.

ЭЛАРАЛЫК ИННОВАЦИЯЛЫК ТЕХНОЛОГИЯЛАР УНИВЕРСИТЕТИ
МЕЖДУНАРОДНЫЙ УНИВЕРСИТЕТ ИННОВАЦИОННЫХ ТЕХНОЛОГИЙ
INTERNATIONAL UNIVERSITY of INNOVATION TECHNOLOGIES

Кыргыз Республикасы, Бишкек ш.
720048, Анкара к., 1/17
тел/факс: +996 312 46-79-14
www.intuit.kg, intuitkg@mail.ru
ИНН 00308200610153

Кыргызская Республика, г. Бишкек
720048, ул. Анкара 1/17
тел/факс: +996 312 46-79-14
www.intuit.kg, intuitkg@mail.ru
ИНН 00308200610153

Kyrgyz Republic, Bishkek city,
720048, Ankara street, 1/17
ph/fax: +996 312 46-79-14
www.intuit.kg, intuitkg@mail.ru
INN 00308200610153

№_2/201__от «_12_»_March_____2025г.

на №_____от «____»_____20__г.

Message

Thank you for your kind message and for the invaluable contributions of CSSTEAP to capacity building in space science and technology across the Asia-Pacific region. Over the past decades, CSSTEAP has been instrumental in fostering technical expertise and strengthening institutional capacities in Kyrgyzstan and Central Asia. Through its high-quality training programs, particularly in Remote Sensing and GIS, the Centre has empowered professionals and researchers with advanced skills to address critical challenges such as natural resource management, disaster risk reduction, and climate resilience.

Kyrgyzstan has greatly benefited from CSSTEAP's initiatives, which have facilitated knowledge transfer, regional collaboration, and the practical application of space technologies for sustainable development. We truly appreciate CSSTEAP's unwavering commitment to education and look forward to continued collaboration in advancing space science capabilities in our region.

Wishing CSSTEAP continued success in its mission.

Best regards,
Prof. Akymbek Abdykalykov

12 March 2025

Message

It is with immense pride that I extend my heartfelt congratulations to the participants, faculty, and organizers of the 28th Post Graduate Course in Remote Sensing & Geographic Information System (RS&GIS). Conducted from July 1, 2024, to March 31, 2025, at IIRS, Dehradun, this program exemplifies CSSTEAP's dedication to advancing space technology education and fostering global expertise in geospatial sciences.

I believe that the 20 participants from 10 countries in this year's cohort, whilst bringing together diverse perspectives, enriching the learning experience, have immensely deepened their technical competencies in digital image processing, geospatial analysis, and satellite-based remote sensing applications under the expert mentorship of faculty from IIRS and other esteemed institutions. Through hands-on training, field visits, and innovative pilot projects, they are now well-equipped to translate their knowledge into real-world solutions, addressing key challenges in their respective countries.

As we mark the valedictory function at IIRS, Dehradun, this is not merely the completion of an academic journey but the beginning of new opportunities. The skills and insights gained here will empower graduates to drive advancements in remote sensing and GIS applications, contributing to sustainable development and national progress.

To the faculty, organizers, and CSSTEAP team, my deepest appreciation for your unwavering efforts in nurturing talent in geospatial sciences!

To the participants-congratulations once again! Your journey as future leaders in remote sensing and GIS starts now, and I have no doubt that you will make a meaningful impact in your professions and beyond. Wishing you continued success in all your future endeavors!

Eng. (Dr.) Sanath Panawennage
(Member of the Public Service Commission of Sri Lanka, and former Director-General ACCIMT)
Governing Board Member & Academic Advisory Committee Member, CSSTEAP

भारत सरकार
अंतरिक्ष विभाग
यू.आर. राव उपग्रह केन्द्र
पोस्ट बाक्स नं. 1795, ओल्ड एयरपोर्ट रोड,
विमानपुरा डाक, बेंगलूरू-560 017, भारत
दूरभाष:
फैक्स:

Government of India
Department of Space
U.R. Rao Satellite Centre
Post Box No. 1795, Old Airport Road
Vimanpura Post, Bengluru - 560 017, India
Telephone:
Fax :

एम. शंकरन
M. Sankaran
*विशिष्ट वैज्ञानिक / **Distinguished Scientist** &*
*निदेशक / **Director***

Message

Climate Change and Impacts of the Climate changes to the Humanity is subject not just for discussion but for swift actions across the world today. At this juncture, I am happy to note that all of you have opted for this Postgraduate Course in Remote Sensing and GIS in CSSTEAP. I congratulate each one of you for your hard work, dedication, and resilience you have shown throughout this program and successfully completing the 9-month course.

I am confident that, in the past nine months of your course tenure, you would have gained knowledge and skills in the fields of remote sensing and geographic information systems- tools that are shaping the future of environmental monitoring, urban planning, disaster management from the domain experts. I wish the knowledge you have acquired here shall help you to contribute to the best in your future works in your home countries.

Notwithstanding this, the contribution CSSTEAP has been remarkable towards capacity building in Space Science Technology and their applications and certainly encouraging. It is aptly evident from the status, that CSSTEAP has been playing a vital role in imparting curriculum based quality education in various domains like RS & GIS, SATCOM, GNSS and has maintained its credibility high amongst UN-affiliated regional centres for Space Science and Technology Education.

On this happy occasion, I congratulate all those involved in its activity and wish the Centre every success in its endeavours so that scientists and experts from the developing countries could benefit for the best future of humankind.

एम. शंकरन
M. Sankaran

भौतिक अनुसंधान प्रयोगशाला
(भारत सरकार, अन्तरिक्ष विभाग की यूनिट)
नवरंगपुरा, अहमदाबाद – 380 009, भारत

Physical Reserach Laboratory
(A Unit of Dept. of Space, Govt. of India)
Navrangpura, Ahmedabad 380 009, India

डॉ. अनिल भारद्वाज, एफएनए, एफएएससी, एफएनएएससी
Dr. Anil Bhardwaj, FNA, FASc, FNASc
जे. सी. बोस नेशनल फेलो / J. C. Bose National Fello
विशिष्ट प्राध्यापक / Distinguished Professor
निदेशक / Director

Message

I am very happy to learn that the 28th PG Course on Remote Sensing (RS) and Geographic Information System (GIS) conducted by Indian Institute of Remote Sensing (IIRS), Dehradun (India) from July 1, 2024, will be concluding on March 31, 2025, with the participation of 20 students from 10 countries of the Asia-Pacific region.

In emerging countries, the tools and techniques of RS and GIS play a vital role in planning, managing and forecasting of natural resources, disaster management and mitigation, and environmental protection for sustainable development. I hope that the participants will be able to apply the knowledge and experience gained from this course in the socio-economic development of their home countries.

I thank the faculty and staff of IIRS and CSSTEAP for the successful organization of this course and I wish all the participants the very best in their future endeavours.

12/3/2025

Date : March 12, 2025

डॉ. अनिल भारद्वाज
Dr. Anil Bhardwaj
निदेशक / Director

E-mail: abhardwaj@prl.res.in / bhardwaj_SPL@yahoo.com Phone: +91-79-26314855/53 Fax: +91-79-26300374

भारत सरकार
अंतरिक्ष विभाग
यराष्ट्रीय सुदूर संवेदन केन्द्र
बालानगर, हैदराबाद-500 037, तेलंगाना, भारत
टेलीफोन: +91 40 23884001/04

Government of India
Department of Space
National Remote Sensing Centre
Balanagar, Hyderabad-500 037, Telengana, India
Telephone: +91 40 23884001 / 04

डॉ. प्रकाश चौहान / Dr. Prakash Chauhan
उत्कृष्ट वैज्ञानिक & निदेशक
Outstanding Scientist & Director

Message

I am delighted that the 28th RS&GIS course being conducted at IIRS, Dehradun has started on July 01, 2024, is concluding on March 31, 2025. The 9-month PG Course is crucial for advancing the participants' careers in the RS & GIS domain and enabling them to acquire new skills and knowledge about EO systems and their uses. The !earnings from this course on EO data analysis, spatiotemporal monitoring of Earth System processes, and decision-making tools would significantly enhance the participants' capabilities in applying them in their respective work domains. It is happy to note that 20 participants from Asia & the Pacific Region have participated in this course. The UNESCAP and ASEAN nominations have demonstrated this course's growing popularity. Congratulations and best wishes to all the participants who have successfully graduated from this course.

I am hopeful that CSSTEAP courses will continue to make a more significant impact and reach far more popularity in the days ahead.

March 18,2025

(Prakash Chauhan)

CSSTEAP: A Brief

ज्ञानं दानात वृध्यते

By giving to other knowledge increases

Centre for Space Science and Technology Education in Asia and the Pacific

Dr. Raghavendra Pratap Singh
Director, IIRS & CSSTEAP

The Centre for Space Science & Technology Education in Asia and the Pacific (CSSTEAP), located at the Indian Institute of Remote Sensing (IIRS) campus in Dehradun, India, is the first UN-affiliated regional center dedicated to capacity building in space science and technology. In its resolution 45/72, dated December 11, 1990, the United Nations General Assembly (UNGA) endorsed the recommendation by the Committee on the Peaceful Uses of Outer Space (COPUOS) to establish regional centers for space science and technology in developing countries, under the auspices of the UN Office for Outer Space Affairs (UNOOSA).

Since its establishment on November 1, 1995, CSSTEAP has quickly become a model international organization for capacity building in space science and technology. It has made significant contributions to regional development by offering countries the opportunity to train specialists in advanced sciences through space technologies. The Centre's strength lies in its blend of expertise: faculty drawn from the Indian Space Research Organization (ISRO), who bring exceptional theoretical and practical knowledge, and access to cutting-edge technology facilities at ISRO centers.

The Centre has an agreement with the Government of India, granting it specific privileges and international status, similar to those enjoyed by UN specialized agencies. Under this agreement, the Centre also has access to the facilities, infrastructure, and expertise of DOS/ISRO institutions, including the Indian Institute of Remote Sensing (IIRS) in Dehradun, Space Applications Centre (SAC) in Ahmedabad, Physical Research Laboratory (PRL) in Ahmedabad, UR Rao Satellite Centre (URSC) in Bengaluru, and the National Remote Sensing Centre (NRSC) in Hyderabad. These resources support one of the world's most comprehensive space programs and have been pivotal to CSSTEAP's success and high standards.

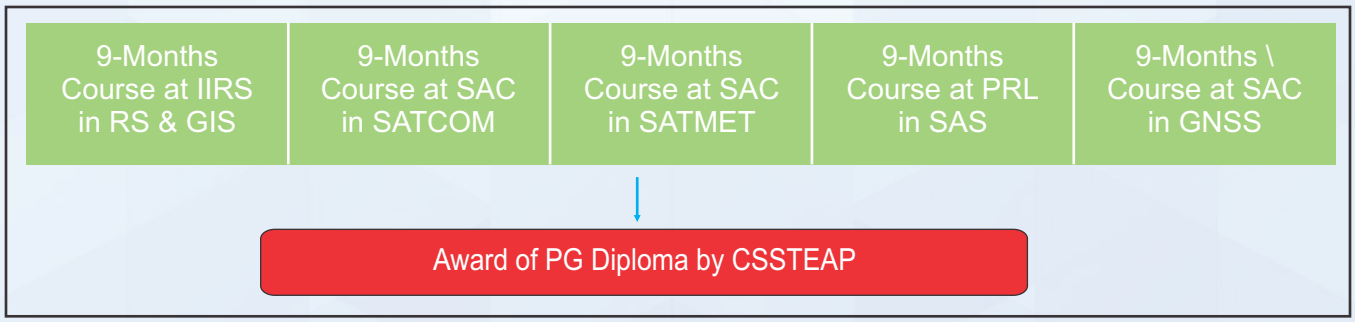
The Centre is governed by a Board consisting of representatives from 18 countries in the Asia-Pacific region, along with three observers (UN-OOSA, UNESCAP and ITC, The Netherlands). It holds formal UN affiliation with the UN Office for Outer Space Affairs (UN-OOSA), which provides support through expert advice, technical assistance, relevant documentation, and guidance on future directions. The Centre's technical activities are overseen by an Advisory Committee (AC) made up of subject matter experts, who critically review curricula, technical facilities, faculty expertise, and other key aspects.

Funding for international travel of participants and subject experts, as well as for tuition fees, scholarships, and the overall management of the Centre, is primarily provided by the Department of Space on behalf of the host country. Additionally, UN-OOSA and UN-ESCAP in Bangkok, Thailand, contribute funding for the travel of select participants. The Centre's educational programmes focus on disseminating knowledge in key areas of space science and technology.

Dr. S. Somanath, Chairman, ISRO/Secretary, Department of Space and Chairman CSSTEAP Governing Board chairing the 29th GB Meeting

The Centre offers nine-months post-graduate (PG) level training in five areas of specialization namely:

a) Remote Sensing and Geographic Information Systems (RS & GIS),
b) Satellite Communication (SATCOM),
c) Satellite Meteorology and Global Climate (SATMET)
d) Space and Atmospheric Science (SAS), and
e) Global Navigation Satellite Systems (GNSS).



Structure of PG diploma educational programmes at CSSTEAP

The Centre has established partnerships with the Indian Institute of Remote Sensing (IIRS) in Dehradun for Remote Sensing (RS) and Geographic Information Systems (GIS) courses. It also collaborates with the Space Applications Centre (SAC) in Ahmedabad to offer postgraduate courses in Satellite Communication (SATCOM), Satellite Meteorology and Global Climate (SATMET), and Global Navigation Satellite Systems (GNSS).

In addition to postgraduate-level courses, the Centre offers regular on-campus short courses ranging from 1 to 4 weeks in duration. These courses include:

- Satellite Navigation & Positioning, in collaboration with the Space Applications Centre (SAC), Ahmedabad.

- Data Acquisition and Data Processing, in partnership with the National Remote Sensing Centre (NRSC), Hyderabad.
- Small Satellite Missions, conducted with the UR Rao Satellite Centre (URSC) in Bengaluru and the Indian Institute of Remote Sensing (IIRS) in Dehradun.
- Special customized themes and disaster risk reduction courses, in collaboration with the Indian Institute of Remote Sensing (IIRS), Dehradun, as well as UN agencies like UNSPIDER and UNESCAP.

Furthermore, the Centre offers various customized online courses that focus on current trends in technology and space applications.

RS&GIS (theme based)	Satellite Navigation & Positioning Data Acquisition & Processing	Small Satellite Missions	Special Course on Demand
IIRS Dehradun	SAC Ahmedabad NRSC, Hyderabad	IIRS, Dehradun/ URSC, Bengaluru	IIRS, Dehradun with UNSPIDER, UNESCAP

1 week to 4 weeks duration

For middle level managers & professionals having 5-10 years' experience in relevant field

Short-term training programmes at CSSTEAP

To ensure the syllabus of CSSTEAP courses remains aligned with the latest advancements in space technology, the Centre regularly updates the curriculum. The updated syllabus is reviewed and finalized by a Board of Studies (BoS), which is formed by the Chairman of the CSSTEAP Governing Board in consultation with the Director of CSSTEAP. This process takes place every three years. The most recent revision of the syllabus and the BoS was conducted for all five courses in 2024. The updated syllabus will be implemented for courses starting in 2025 and will remain in effect for the next three years.

The educational programmes are conducted in English, and for participants who require assistance in improving their English language skills, support is provided upon their arrival on campus. The courses are delivered in smart classroom environments, utilizing modern teaching methods and tools, including multimedia tutorials for self-study. Practical sessions take place in the laboratories and skill development facilities of the Department of Space (DOS) institutions.

At each host institution, the majority of faculty (approximately 80% of the teaching time) is drawn from the host institution. When necessary, additional faculty members are sourced from other DOS/ISRO institutions (~10%), as well as from professional, scientific, or academic institutions within India, or from global institutions, including those from the Asia-Pacific region (~5%). To enhance participants' exposure to their respective fields, the Centre also arranges technical visits to scientific institutions, laboratories, and national symposia across India.

CSSTEAP Foundation Day Celebration with 28th RS&GIS Participants

Valedictory session for participants of 27th RS&GIS Course

Achievements

CSSTEAP has been actively conducting Post Graduate and Short Courses in various disciplines for the past 29 years. To date, the Centre has successfully conducted 70 postgraduate courses, including 27 in Remote Sensing & GIS, 13 in Satellite Communication (SATCOM), 13 in Satellite Meteorology (SATMET), 13 in Satellite Applications Systems (SAS), and 4 in Global Navigation Satellite Systems (GNSS). In addition, the Centre has organized numerous short courses and workshops over the years.

These programs have benefited approximately 4,007 participants from 38 countries in the Asia-Pacific region. Moreover, 88 participants from 27 countries outside the Asia-Pacific region have also gained from these initiatives. Of these, 1,129 participants have completed postgraduate courses, while 2,878 have participated in short courses. In 2024 alone, the Centre conducted 3 postgraduate diploma courses, 5 online short courses, and 5 offline short courses.

Short/ offline - Courses -2024

1. Short course on DRR- “SAR Remote Sensing for Land Deformation Studies” during June 3-14, 2024 at IIRS, Dehradun. (27 participants from 13 countries)
2. Short course on "Weather Forecasting using Numerical Weather Prediction Models” during July 22-02 August 2024 at SAC, Ahmedabad. (23 participants from 10 countries)
3. Short course on "Satellite Remote Sensing for Ocean Applications” during October 14-25, 2024 at NRSC, Hyderabad. (16 participants from 07 countries)
4. Short course on Satellite Remote Sensing Data Acquisition and Processing during November 18 - 29, 2024 at NRSC, Hyderabad (21 participants from 11 countries)
5. Short course on 13th “Small Satellite Mission” during November 18 - 29, 2024 at IIRS, Dehradun. (29 participants from 14 countries)

Short/ Online - Courses- 2024

1. Online Short Course on “Forest Carbon Dynamics Assessment Using Earth Observation Data” during September 02 to 06, 2024 at IIRS, Dehradun. (19 participants from 07 countries)
2. Online Short Course on “Solar Physics” during September 02-06, 2024 at PRL, Ahmedabad. (68 participants from 06 countries)
3. Online Short Course on “Planetary Science” during September 09-13, 2024 at PRL, Ahmedabad. (28 participants from 04 countries)
4. Online course on “Earth's Atmosphere and Climate Change” during October 21-25, 2024 at PRL Ahmedabad. (53 participants from 08 countries)
5. Online Course on “Use of Space Technology for Weather and Climate Studies” during November 04-14, 2024 at SAC Ahmedabad. (34 participants from 11 countries)

About Host Institute: Indian Institute of Remote Sensing (IIRS)

The Indian Institute of Remote Sensing (IIRS), a unit of the Indian Space Research Organization (ISRO), Government of India, is one of the country's premier educational institutions dedicated to capacity building in Remote Sensing (RS), Geographical Information Systems (GIS), and their applications. Originally known as the

Indian Photo-interpretation Institute (IPI), the Institute was founded on April 21, 1966, under the aegis of the Survey of India (SOI). It was established in collaboration with the Government of the Netherlands, modeled after the Faculty of Geo-Information Science and Earth Observation (ITC) at the University of Twente, formerly known as the International Institute for Aerospace Survey and Earth Sciences.

The idea to set up the Institute was conceived by India's first Prime Minister, Pandit Jawaharlal Nehru, during his visit to The Netherlands in 1957. The Institute's building, located on Kalidas Road in Dehradun, was officially inaugurated on May 27, 1972. Since its inception, IIRS has played a crucial role in building capacity in remote sensing, Geoinformatics technology, and their applications, benefiting both the Indian and international user communities. The Institute has continually upgraded its capabilities to keep pace with technological advancements, fulfilling the growing demands and responsibilities of the Indian and global communities.

Since its establishment five decades ago, IIRS has played a pivotal role in capacity building within India and the Asian region, targeting a wide range of groups, from fresh graduates and engineers to postgraduate students and policymakers. The Institute also hosts and conducts training and educational programs in Remote Sensing (RS) & Geographical Information Systems (GIS) offered by the Centre for Space Science & Technology Education in Asia and the Pacific (CSSTEAP), affiliated with the United Nations.

IIRS contributes significantly to capacity building through three primary areas: Training & Education, Research, and Outreach. The Distance Learning Program (DLP) offered by the Indian Institute of Remote Sensing (IIRS), Indian Space Research Organization (ISRO), is an initiative aimed at training students and professionals from academia and user departments in the fields of geospatial technology and Earth Observation. To meet the online training needs of international users, IIRS has been conducting the International Distance Learning Programme under the ISRO-IIRS Space Application Training (ISAT) program since 2020. In October 2020, IIRS developed and launched a dedicated portal, Learning Management System (LMS), and the E-CLASS International platform specifically designed for international users.

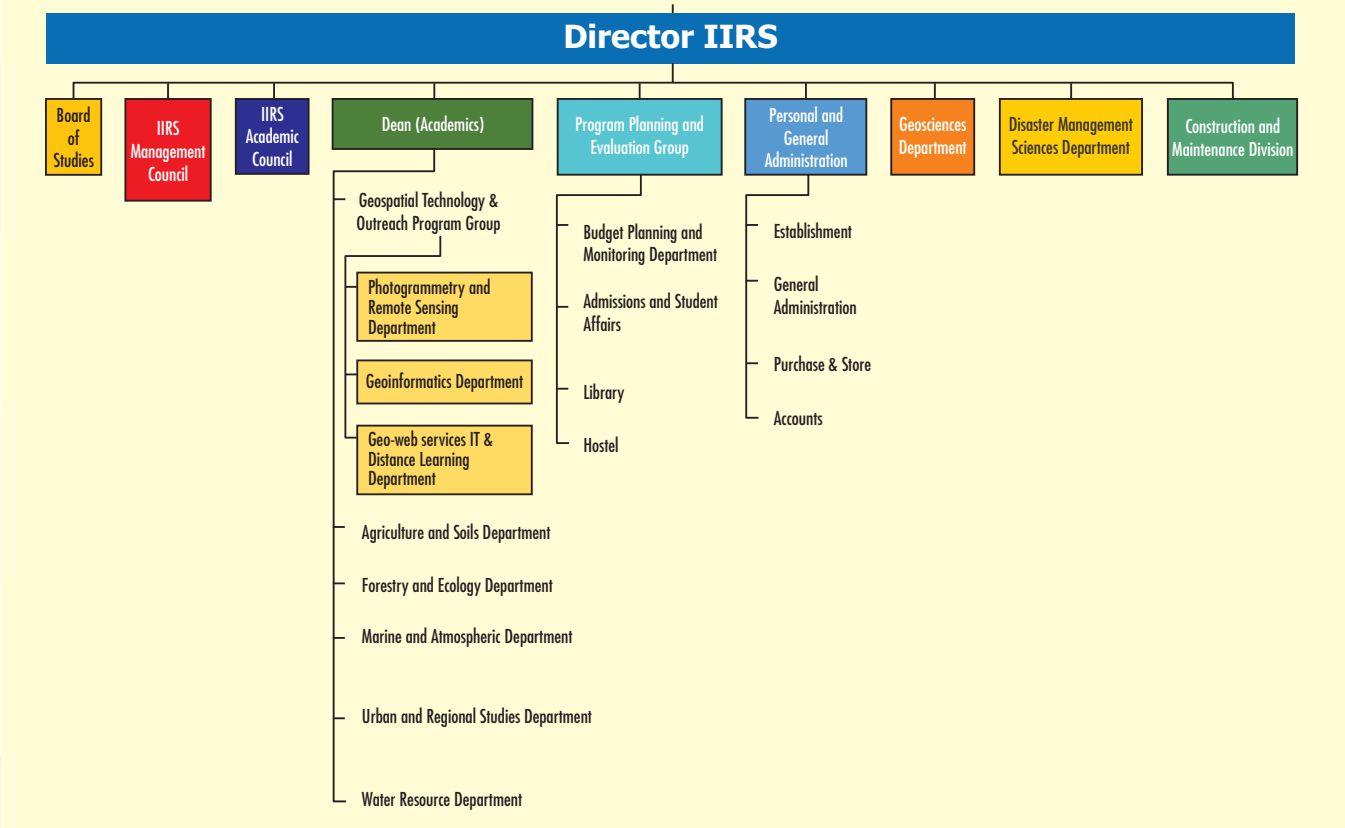
Today, IIRS offers programs for users at all levels, including mid-career professionals, researchers, academics, fresh graduates, and policymakers. Thanks to the sustained efforts of its dedicated faculty and management, the Institute has remained at the forefront of the field for nearly five decades, evolving from a photo-interpretation institute to a globally recognized institution in remote sensing and geo-information science.

The Institute has a robust, multi-disciplinary, and solution-oriented research agenda, focusing on developing advanced methods and techniques for processing, visualizing, and disseminating Earth Observation (EO) data and geo-information. These advancements support various societal applications and enhance the understanding of Earth's system processes. Key research areas include microwave, hyperspectral, and high-resolution EO data processing and their applications.

IIRS is equipped with state-of-the-art laboratory and field-based instrumentation, along with an extensive network of observatories, to meet its research goals. Among the prominent facilities are the atmospheric CO2 measurement network, observatory for aerosol climatology, carbon flux towers for measuring energy, water vapor, and CO2 exchanges, field observatories for soil erosion and runoff assessment, laser profiling, AWS, and field observatories for hydrological modeling. Additionally, the Institute has full-fledged Digital Image Processing (DIP) and GIS labs, supporting its comprehensive research objectives.

The Organizational Structure

Recognizing the growing need for focused training and education to effectively utilize ISRO's forthcoming advanced Earth Observation Systems, IIRS was granted the status of a Unit of ISRO, effective from April 30, 2011. The Institute is led by a Director who reports to the Chairman of ISRO and the Secretary of the Department of Space.



The overall activities of IIRS are guided by the Management Council, while academic programs are overseen by both the Management Council and the Board of Studies. The Dean (Academics) is responsible for the implementation of the academic programs. A highly motivated and dedicated team of multidisciplinary scientists and engineers work together to achieve the Institute's objectives.

Capacity Building Programmes of the Institute

The training and capacity-building programs at IIRS are designed to cater to the needs of various target user groups, including professionals at working, middle, and supervisory levels, fresh graduates, researchers, academics, and decision-makers. The duration of these courses ranges from one week to two years. Each program is carefully crafted by domain experts and subsequently approved by the Board of Studies (BoS) and the Academic Council (AC), which consist of renowned subject matter experts. A dedicated team of scientists at IIRS plays a key role in delivering the course content, and guest faculty members from prestigious organizations and institutions, both within India and internationally, are regularly invited to share their knowledge and expertise with the participants.

The Institute offers several prominent training and educational programs, including Post-Graduate Diploma (PGD) in Remote Sensing and GIS across nine disciplines, M.Sc. and Post-Graduate Diploma (PGD) in Geoinformatics, offered in collaboration with the Faculty of Geo-Information Science & Earth Observation (ITC) of the University of Twente (UT), The Netherlands.

In addition to its core programs, IIRS offers a range of other courses, including Certificate Programs (including the NNRMS-ISRO sponsored program for university faculty), Awareness Programs, and Special On-Demand/Tailor-Made Courses.

To date, the Institute has trained a total of 15533 professionals, including 1629 from abroad, representing 115 countries across Asia, Africa, and South America.

Through its Outreach Programs, IIRS provides courses for working professionals, researchers, and students using state-of-the-art studio and e-learning platforms. The IIRS DLP began in 2007 with 312 participants from twelve universities in India. By December 2024, IIRS had successfully conducted 210 outreach programs through live and interactive classroom sessions (also known as the EDUSAT program), benefiting over 973,000 participants from 3,650 networked institutions across the country.

To inspire and spread awareness about space technology among school teachers and students, IIRS organizes special programs in both Distance Learning and on-campus formats. Additionally, IIRS has launched Massive Open Online Courses (MOOCs) on various topics to expand its outreach and enable a wider section of society to benefit from its educational resources.

CSSTEAP participants with Chairman, ISRO and Director IIRS/CSSTEAP

IIRS Campus, Dehradun

Course Report

28th Post Graduate Course on Remote Sensing & Geographic Information System (RS & GIS)

The 28th Postgraduate Course on Remote Sensing & Geographic Information System (RS & GIS) officially commenced on July 1, 2025. This cohort comprised 20 participants from 10 countries across the Asia-Pacific region. The participants included four from India, three each from Sri Lanka and Mongolia, two each from Myanmar, Bangladesh, and Uzbekistan, and one each from Thailand, Nepal, Kazakhstan, and Tajikistan. The participants came from diverse fields, such as Meteorology, Hydrometeorology, Geology, Hydrology, Land Management, Agro-meteorology, Electrical Power Engineering, Forestry, Environmental Conservation, Fisheries, Irrigation, Remote Sensing, GIS, Civil Engineering, Surveying, and Defense, all contributing their expertise to various roles in their respective organizations.

Participants of 28th RS&GIS PG Diploma Course with Director CSSTEAP/IIRS

The course began with an induction program, which provided an overview of the course structure, introduced participants to the CSSTEAP campus, and highlighted the available facilities. Following the induction, Semester-I commenced, covering fundamental topics such as the principles of remote sensing, photogrammetry, image interpretation and analysis, geoinformatics, and natural resource and environmental management. This semester focused on building foundational knowledge. Semester-II introduced two compulsory subjects: advanced remote sensing and geoinformatics. These topics included hyperspectral and microwave remote sensing principles, spatial database design, storage and retrieval, programming fundamentals, web GIS, open platforms for geoprocessing, AI/ML, and spatial sampling and variogram modeling. In addition to the compulsory subjects, participants had to choose two elective papers based on their academic background, professional experience, and the needs of their parent organizations. In this batch, 14 participants selected Advances in Image Analysis & Geoinformatics, 4 chose Agricultural & Soil Resource Management, and 2 opted for Forest Resource & Ecosystem Analysis. In Elective-II, 9 participants chose Natural Hazards and Disaster Risk Management, 2 selected Marine and Atmospheric Remote Sensing, and 9 opted for Satellite Hydrology & Water Resource Management.

The students also delivered seminars on the subjects taught to them, providing an excellent opportunity to enhance their presentation skills. This allowed the students to not only deepen their understanding of the topics but also develop their ability to communicate complex ideas effectively to an audience. The seminars encouraged active participation and fostered a collaborative learning environment, where students could exchange knowledge and refine their public speaking and presentation techniques.

The participants were assessed through a combination of internal assessments, semester-end exams, and practical evaluations. The core syllabus was delivered by the IIRS faculty, with additional guest lectures on specialized topics to enrich the participants' academic experience. Field excursions were organized for ground truth data collection and satellite data interpretation and analysis, further enhancing the practical learning experience.

S.No.	Name	Elective-I	Elective-II	Country	Photograph
1.	Mr. Nasir Uddin Khan	Advances in Image Analysis & Geoinformatics	Natural hazards and Disaster Risk Management	Bangladesh 	
2.	Mr. Md. Abdur Rahman-Al-Mamun	Agricultural & Soil Resource Management	Marine and Atmospheric Remote Sensing	Bangladesh 	
3.	Ms.Jallu Madhubhargavi	Advances in Image Analysis & Geoinformatics	Satellite Hydrology & Water Resource Management	India 	
4.	Cdr Surendra Rawat	Advances in Image Analysis & Geoinformatics	Marine and Atmospheric Remote Sensing	India 	
5.	Wg Cdr Kadambur Sriram Sudharshanan	Advances in Image Analysis & Geoinformatics	Natural hazards and Disaster Risk Management	India 	
6.	Wg Cdr Raj Kumar Maurya	Advances in Image Analysis & Geoinformatics	Natural hazards and Disaster Risk Management	India 	
7.	Ms. Perizat Mukhitovna Moldakhmetova	Advances in Image Analysis & Geoinformatics	Natural hazards and Disaster Risk Management	Kazakhstan 	
8.	Ms. Mungunchimeg Nasanbat	Agricultural & Soil Resource Management	Natural hazards and Disaster Risk Management	Mongolia 	
9.	Ms. Perliimaa Gantumur	Advances in Image Analysis & Geo Informatics	Natural hazards and Disaster Risk Management	Mongolia 	
10.	Mrs. Suvd-Erdene Tseyeregzen	Advances in Image Analysis & Geo Informatics	Natural hazards and Disaster Risk Management	Mongolia 	

S.No.	Name	Elective-I	Elective-II	Country	Photograph
11.	Mr. Si Thu Myo Aung	Forest Resource & Ecosystem Analysis	Satellite Hydrology & Water Resource Management	Myanmar	
12.	Mr. Ye Min Htay	Advances in Image Analysis & Geoinformatics	Satellite Hydrology & Water Resource Management	Myanmar	
13.	Ms. Babita Neupane	Forest Resource & Ecosystem Analysis	Natural hazards and Disaster Risk Management	Nepal	
14.	Mr. Samarakkodi Jayalath Charuka Sandaruwan	Agricultural & Soil Resource Management	Satellite Hydrology & Water Resource Management	Sri Lanka	
15.	Mrs. Pathirannahalage Mahesha Prasanjali Chandrasekara	Advances in Image Analysis & Geoinformatics	Natural hazards and Disaster Risk Management	Sri Lanka	
16.	Mr. Imantha Supun Gunasekara	Advances in Image Analysis & Geoinformatics	Satellite Hydrology & Water Resource Management	Sri Lanka	
17.	Mr. Bahrom Homidov	Agricultural & Soil Resource Management	Satellite Hydrology & Water Resource Management	Tajikistan	
18.	Mr. Thitipong Boontan	Advances in Image Analysis & Geoinformatics	Satellite Hydrology & Water Resource Management	Thailand	
19	Mr. Muzaffarjon Murodov	Advances in Image Analysis & Geoinformatics	Satellite Hydrology & Water Resource Management	Uzbekistan	
20	Ms. Shakhzoda Abdurakhmanova	Advances in Image Analysis & Geoinformatics	Satellite Hydrology & Water Resource Management	Uzbekistan	

RS&GIS Syllabus Overview

Semester-I (Module-1): Compulsory

Remote Sensing-I : • Physics of Remote Sensing • Spectral Signature, In-situ measurements and Visual image interpretation • Platforms & Sensors • Remote Sensing Data Errors, Data Products and their sources • Principles of Thermal Remote Sensing

Image Interpretation and Analysis: • Statistics for Image Processing • Image Pre-processing • Image Enhancement • Image Transforms & Fusion • Image Classification

Photogrammetry: • Aerial Photography • Stereo Photographs & its Geometry • Stereo Photogrammetry • Digital Photogrammetry • Satellite Photogrammetry

Geoinformatics-I: • Overview of GIS, Geodesy • Data models, and Data Quality • Spatial Data Analysis • GNSS and Its Applications • SDI and Recent trends in GIS

Natural Resource & Environmental Management (NREM): • NREM-1 • NREM-2 • NREM-3 • NREM-4 • NREM-5

Study Tour

Field Visits

Semester End Examination

Semester-II (Module-2): 2 Compulsory & 2 Elective Paper

Remote Sensing- II: • Hyperspectral Remote Sensing • Hyperspectral Data Classification and Application • Microwave Remote Sensing • SAR Data Processing • Change Detection

Geoinformatics-II: • Spatial Database Design, Storage and Retrieval • Basics of Programming Language and Data structures • Web GIS and open platforms for geoprocessing • Overview of ML • Spatial Sampling and Variogram Modeling

Elective-I: • Agricultural & Soil Resource Management • Forest Resource & Ecosystem Analysis • Urban & Regional Studies • Advances in Image Analysis & Geoinformatics

Elective-II: • Satellite Hydrology & Water Resource Management • Geological Remote Sensing • Marine and Atomospheric Remote Sensing - Natural Hazards and Disaster Risk Management

Study Tour

Field Visits

Semester End Examination

Semester-II Module-3

Pilot Project Study & Seminar Presentation

Attending Classes

Attending Lab Demonstrations

Field Visit to NIH Roorkee

Field Visit to Isotope Hydrology Unit, NIH Roorkee

Field Visit to Asan Barrage

RS & GIS Participants at Library

Pilot Project

Participants worked on various pilot projects, which were approved by a panel during the pilot project synopsis presentation. Each project was conducted under the guidance of their respective supervisors. The topics covered a wide range of applications, including GIS-based route and site suitability analysis, monitoring urban green space dynamics, improving DEM vertical accuracy using space borne LiDAR, urban feature extraction through machine learning, geospatial analysis of spring floods, agricultural drought assessment, snow and glacier dynamics, analysis of the relationship between corn cultivation, burnt areas, and AOD, understanding landscape fragmentation, reservoir sedimentation assessment using SAR data, and studies on air pollution and ship detection.

The project topics undertaken by the participants were:

S.No.	Name of Participants	Research Title
1	Mr. Nasir Uddin Khan	Monitoring Urban Green Space Dynamics in Dhaka Metropolitan Area Using Multi-Temporal Satellite Imagery
2	Mr. Md. Abdur Rahman-Al-Mamun	Identification of Potential Fishing Zone (PFZ) along Kerala coast, India
3	Ms. Jallu Madhubhargavi	GIS-Based Route and Site Suitability Analysis for Enhancing Last-Mile Delivery in Dehradun City
4	Cdr Surendra Rawat	Ship Detection using SAR Dataset
5	Wg Cdr Kadambur Sriram Sudharshanan	Improvement of DEM Vertical Accuracy using Space-Borne LIDAR
6	Wg Cdr Raj Kumar Maurya	Urban Feature Extraction from Cartosat 2E Satellite Data Using Machine Learning
7	Ms. Perizat Mukhitovna Moldakhmetova	Geospatial Analysis of the Spring Floods of April 2024 in parts of the Ural River basin in the Western Region of Kazakhstan
8	Ms. Mungunchimeg Nasanbat	Assessment of Agricultural Drought using Earth Observation Satellite and Pasture Yield Statistics
9	Ms. Perliimaa Gantumur	Potential Land Use Conflict Identification in Bulgan province, Mongolia using Geospatial Techniques and MCDM
10	Mrs. Suvd-Erdene Tseyeregzen	Examining the Effect of Representative Sampling in Fuzzy ML Models: A Case Study Water Bodies and Gold Mining Sites
11	Mr. Si Thu Myo Aung	Spatiotemporal Surface Water Quality Mapping and Monitoring Using AI/ML in Yangon Region, Myanmar
12	Mr. Ye Min Htay	Remote Sensing-Based Flood Analysis in Myanmar Using SAR and Optical Data: A Case Study of Ayeyarwady River Basin, Myanmar.
13	Ms. Babita Neupane	Understanding the Landscape Fragmentation Status and Recovery Trends in Nepal.
14	Mr. Samarakkodi Jayalath Charuka Sandaruwan	Understanding the hydrological response of Norwood Watershed using Modelling Approach
15	Mrs. Pathirannahalage Mahesha Prasanjali Chandrasekara	LiDAR Technology and Ortho image for 3D Building Extraction: A Comprehensive Approach for Solar PV Potential Estimation
16	Mr. M.V. Imantha Supun Gunasekara	Reservoir Sedimentation Assessment Using SAR Data
17	Mr. Bahrom Homidov	Snow and Glacier Dynamics Study of Upper Muksu River basin using Remote Sensing and Modeling Techniques
18	Mr. Thitipong Boontan	Analysis of the relationship between corn cultivation, burnt area, and AOD in Chiang Mai, Thailand.
19	Ms. Shakhzoda Sobirovna Abdurakhmanova	Machine Learning based analysis of land use changes in Tashkent, Uzbekistan
20	Mr. Muzaffarjon Makhmut Ugli Murodov	Study of Air pollution over Uzbekistan using model data reanalysis

English Coaching

In addition to the academic activities, special efforts were made to enhance the participants' English proficiency. Evening classes were conducted after office hours for three months, focusing on speaking, listening, and writing skills. These classes aimed to assist participants in composing their project reports and improving their presentation skills.

Educational Tour

As part of the course curriculum, the participants embarked on a study tour to Ahmedabad, Gujarat, from November 16th to 24th, 2024. During the tour, they visited the Space Applications Centre (SAC) campus, where they explored the Vikram Sarabhai Space Exhibition (VSSE), the Physical Research Laboratory (PRL), and various SAC facilities. These included the Meteorological and Oceanographic Satellite Data Archival Centre (MOSDAC), Sensor Development Area (SEDA), Microwave Remote Sensing Area, and the PLASIV Lab.

The visit to the Physical Research Laboratory (PRL) and MOSDAC allowed participants to gain valuable insights into the diverse laboratories, facilities, and functions related to space applications. Additionally, they toured Asia's second-largest cleanroom facility for satellite assembly at SAC, Ahmedabad. This facility is one of the most advanced and sophisticated cleanrooms in India.

28th RS and GIS participants at Vikram Sarabhai Space Exhibition (VSSE), SAC Ahmedabad

RS and GIS participants at PRL campus Ahmedabad.

TRISHNA Workshop

The participants attended the International Science Workshop on High-Resolution Thermal Earth Observation (2024) (TRISHNA), a satellite mission jointly developed by the Indian Space Research Organization (ISRO) and the French Space Agency. Scheduled for launch aboard the Polar Satellite Launch Vehicle (PSLV) in 2026, TRISHNA is expected to operate for five years, with a possible two-year extension. The satellite will provide a

spatial resolution of 60 meters and a revisit period of three days at the equator, with more frequent revisits at higher latitudes.

A primary objective of the TRISHNA mission is to offer consistent and systematic records of surface temperature, along with several biophysical variables. These data will support the modeling of surface energy balance, enabling the derivation of heat fluxes and the estimation of evapotranspiration.

The main workshop took place from November 19-21, 2024, and featured keynote speeches, technical sessions, and panel discussions led by leading experts and scientists. Prior to the workshop, a two-day tutorial was held at the SAC Bopal Technical Campus in Ahmedabad from November 17-18, 2024. This tutorial was designed for students and young researchers with experience in remote sensing, particularly thermal data and surface energy balance models. It covered essential topics such as thermal remote sensing, radiative transfer models, data retrieval, surface energy balance, and evapotranspiration modeling. Distinguished scientists from India and abroad conducted the sessions.

28th RS and GIS participants at TRISHNA Workshop, SAC Ahmedabad

CSSTEAP Foundation Day Celebrations

The 29th foundation of CSSTEAP was celebrated on November 1, 2025, marking a special occasion in the center's history. What made this event unique was that the participants took the center stage, handling the organization and execution of the entire event. In a first for the institute, the inaugural edition of a student newsletter was launched, adding a new dimension to the celebration. The first issue of the student magazine was unveiled by the Director of CSSTEAP/IIRS. This inaugural edition featured a mix of scientific and general articles, offering a curated collection of insightful pieces penned by the students themselves. These articles showcased their deep understanding of the subject and their passion for innovation. The magazine not only reflects the enriching journey of the course participants but also serves as a vibrant platform that highlights their research, expertise, and pioneering contributions to the field of Remote Sensing and GIS.

Students News Letter

CSSTEAP Interaction Meet:

During the educational tour, a joint interaction meeting with CSSTEAP participants from RS&GIS, SATCOM & GNSS courses along with the Course Directors and senior officials of SAC and PRL on 18th November, 2024.

The interaction meeting provided a platform for all the participants to meet each other and discuss on various issues. Meet allowed them to exchange knowledge, share experiences, and learn about different cultures. A special dinner was organized by the Director of IIRS to foster networking and collaboration.

CSSTEAP Joint Interaction Meet of participants from RS&GIS, SATMET and GNSS PG Diploma Courses at Ahmedabad

Cultural Visits

In addition to the training and research activities, participants visited several cultural and historic landmarks, including the Sabarmati Riverfront, Atal Bridge, Akshardham Temple, and the Adalaj Stepwell (Adalaj Vav). They also visited the Statue of Unity, standing at 182 meters (597 feet), making it the tallest statue in the world. The tour offered a deeper insight into India's rich cultural heritage, local markets, diverse foods, and historical sites.

Interaction with Distinguished Speakers

In addition to the activities mentioned above, the participants had the opportunity to attend guest lectures delivered by several renowned academicians and researchers. They also had the unique privilege of meeting and interacting in person with the current ISRO Chairman Dr. V. Narayanan, and the former Chairman, Dr. S. Somnath.

List of talks delivered by distinguished Speakers and Guest Lecturers to CSSTEAP participants

Name	Designation
Dr. V. Narayanan	Chairman ISRO
Dr. S. Somanath	Former Chairman ISRO
Dr. R. R. Navalgund	Former Director, SAC & NRSC, ISRO
Prof. Emmanuel Trouve	Director , LISTIC , Savoie Mont Blanc University , Annecy , France
Prof. RP Singh	Department of Physics, Computational Science and Engineering, Schmid College of Science, Chapman University,
Dr Sayantan Majumdar	Assistant Research Professor of Hydrologic Sciences, Desert Research Institute, USA
Prof.J.R.Kayal	Former Deputy Director General, GSI , Kolkata

28th RS and GIS participants with Prof RP Singh, Chapman University at CSSTEAP HQ

Participants in discussion with Dr A Senthil Kumar former Director CSSTEAP/IIRS

Campus Life

Participants were accommodated in an international hostel, equipped with kitchenettes and Wi-Fi access in their rooms, ensuring a comfortable and convenient stay. For recreation, they had access to various indoor sporting facilities, including a gymnasium, table tennis, and a snooker table, along with outdoor sports amenities. Throughout their time on campus and during the educational tour, participants had the opportunity to immerse themselves in India's rich cultural heritage, celebrating its traditions, customs, and cuisines. National Days for all participant countries were celebrated with great enthusiasm and vigor, where participants from respective countries gave presentations about their countries, culture, and traditions. They also engaged in a wide range of activities, such as a sports week, cultural festivals, Indian festivals, sightseeing, and visits to significant cultural, historical, and heritage sites. Among the participants, Ms. Perliimaa Gantumur from Mongolia achieved remarkable success, securing first place in the 15 km Doon Marathon and second place in the 25 km ultra-marathon, with a time of 2 hours 51 minutes in the 18-30 age female category. Additionally, Mr. Thitipong Boontan from Thailand participated in the demanding 50 km Dehradun Ultra Marathon, completing the race in 6 hours 11 minutes.

Winner of Sports meet felicitated by Director CSSTEAP/IIRS

Dr. Sanjeev Kumar Singh
Course Coordinator, RS&GIS
sksingh@iirs.gov.in

Mr. C.M. Bhatt
Course Director, RS&GIS
cmbhatt@iirs.gov.in

List of Faculty

Name	Topics	Photograph
Dr. R.P. Singh	• EO data applications for natural resources management	
Dr. Pramod Kumar	• Urban resource planning • Urban land use planning • Urban area analysis	
Mrs. Shefali Agrawal	• Remote Sensing • Principles and applications of hyperspectral RS • Image Analysis • UAV RS • Satellite Photogrammetry	
Dr. R.S Chatterjee	• SAR interferometry and its applications • Ground water geology	
Dr. Debashish Mitra	• Coastal Zone Management • Coastal geology and geomorphology • Coastal hazards and its mitigation • Coastal processes and modelling • Climate change impact on coastal zone • Land ocean Interaction	
Dr. Suresh Kumar	• Soil Resource Mapping, • Land Evaluation • Watershed Management • DTA for watershed delineation soil taxonomy	
Dr. N.R Patel	• Integrating RS and crop grwoth model for crop condition assessment • Crop condition, assessment and Crop yield modelling • Hyperspectral RS applications • Agromet parameters retrieval • Hyperspectral RS application	
Dr. Anil Kumar	• Image Classification • Temporal Data, Fuzzy Classifier and Deep learning models	
Dr. Hari Shanker Srivastav	• LULC analysis, Microwave RS in agriculture • Soil moisture estimation	

Name	Topics	Photograph
Mrs. Minakshi Kumar	• Digital Image Analysis • Image Preprocessing and Enhancement techniques • Texture analysis • Image segmentation • Object Based Image Analysis	
Dr. Arijit Roy	• Sampling techniques in forest inventory • Predictive modeling • Decision support systems • Climate change impacts on forests and biodiversity • Forest fire monitoring and early warning	
Dr. Sandeep Maithani	• Urban planning, Machine learning & CA in urban growth modelling • Urban hazard & risk assessment • Urban land surface temperature studies	
Dr. Harish Karnatak	• Bhuvan overview, Geodata abstraction library, Iterations, functions & recursion • WebGIS services, Open source GIS	
Dr. Hitendra Padalia	• Role of EO data in sustainable forest management • Role of RS and GIS in Forestry and Ecology	
Dr. Praveen K. Thakur	• Quantification of hydrological elements: Precipitation, WL/River Flow • Snow and glacier mapping and melt modelling • Flood and GLOF modelling; Flood early warning system	
Dr. Yogesh Kant	• EO systems for climate change studies • RS application for air quality monitoring • Satellite based aerosol studies	
Dr. Vandita Srivastav	• Geoinformatics • Image processing and Analysis • Information Extraction • Geoinformation Management	
Mr. Chandra Mohan Bhatt	• Disaster Risk Reduction & Management: Concepts & Overview • Earth Observation for Disaster Risk Reduction • Application of EO Data for Sustainable Development Goals (SDGs) • Flood hazard, risk & vulnerability	
Dr. (Mrs.) Poonam S. Tiwari	• Digital and close range photogrammetry • Lidar Remote Sensing • Image Processing, Machine Learning, Deep Learning • Geospatial technologies for Archeological studies	

Name	Topics	Photograph
Dr. Ashutosh Bhardwaj	• Stereo photographs and its geometry • Stereo photogrammetry • Introduction to digital surface generation • Advances techniques in SAR interferometry	
Dr. (Mrs.) Hina Pande	• Lidar Remote Sensing & Application • Photogrammetry & Application • Image processing application in automated feature extraction • Heritage documentation with geospatial methods	
Dr. Kshama Gupta	• Image Interpretation of Urban Areas • 3D Modeling Techniques for urban Surface profiling • DEM/DSM Generation for Urban Areas, Modeling and Visualization • Geospatial Technologies for Urban Heritage and Conservation • Urban Open Spaces and Green Spaces, Blue-green infrastructure • Urban Climate : Factors Affecting Urban Climate, Impact of Urban Surfaces, Diseases and Human Health • Urban Climate modeling, Urban canopy parameters, Heat wave	
Dr. (Mrs) Dipanwita Haldar	• Land use / Land cover (LULC) Analysis • Crop Inventory and mapping/discrimination • Optical and Microwave Remote Sensing • Physico-chemical factors of soil and pedogenic factors	
Mr. Kapil Oberai	• GIS data creation, optimization, Conceptual models of non-spatial information, relation algebra • Spatial databases, SQL spatial querying, Python imaging, connectivity, location based services & KML	
Dr. Subtrata Nandy	• High resolution remote sensing for vegetation mapping • Growing stock, biomass estimation using optical data • LiDAR applications is forest inventory • Multi-criteria decision making for ecological applications • Wildlife habitat suitability analysis and protected areas	
Dr. Vaibhav Garg	• Hydrological modeling using GWS portal inputs • Water body and water quality mapping • Reservoir sedimentation • Urban hydrology: storm drainage networks	
Dr. (Mrs.) Shuchita Srivastava	• Retrieval of temperature, trace gases & ozone • Gaseous air pollutants - chemistry, transport & monitoring • Green house gases & their implication	
Dr. Shovan Lal Chattoraj	• Spectroscopy of rocks and minerals • RS applications in Engineering Geology and Landslides	
Mr. Dharmendra Kumar	• Database and webserver handling for Geo Applications • Cyber security Analysis of Network systems • Aerial data Analysis.	

Name	Topics	Photograph
Mr. Ashutosh K Jha	• Agent based modelling, database connectivity, spatial variation models, dependence measures, Geo-visualization, LULU Modeling HPC computation	
Dr. Charu Singh	• Rainfall retrieval, monsoon studies, Extreme events • Tropical dynamics ENSO etc • Regional & Climate Modeling, Climate dynamics	
Dr. Shashi Kumar	• Principles of thermal and microwave remote sensing • Polarimetric SAR Remote Sensing • SAR interferometry	
Dr. Manu Mehta	• Physics of remote sensing • Spectral signature, In-situ measurements and visual image interpretation • Radiometric and atmospheric corrections for Remote Sensing data	
Mr. Ravi Bhandari	• Programming for geospatial applications	
Mr. Prasun Kumar Gupta	• h/w, s/w requirements for GIS, database design using UML, attribute & positional uncertainty, basic programing concepts, web programing	
Mr. Vinay Kumar	• Hyperspectral Remote Sensing and data processing • Platforms & sensors, Resolution • Satellite mission & their characteristics	
Mr. Ashish Joshi	• Principles of Microwave Remote Sensing • SAR Interferometry • Terrain Analysis. • Statistics for Image Processing	
Dr. Ashutosh Srivastava	• GNSS and its applications	
Dr. Kamal Pandey	• Strings, tuples, dictionaries, GDAL • Open source GIS s/w, • Server side scripting, • Web mapping using open layers	
Dr. Hari Shankar	• Network analysis, spatial data quality • Spatial variation models & dependence measures • SAR interferometry for land deformation	

Name	Topics	Photograph
Dr. Arpit Chouksey	• Quantification of hydrological elements: interception and Soil Moisture • Water Balance studies • Integrated watershed management • Waterlogging and Soil Salinity • Trend analysis of hydro-meteorological data	
Dr. Pratima Pandey	• Glaciology, climate change impact on cryosphere • Landform dynamics • Permafrost	
Mrs. Richa Sharma	• Spectroscopy of minerals, hyperspectral RS mineral exploration • RS for geology, DIP • Hyperspectral RS • Mineral exploration	
Ms. Pooja Jindal	• Meteorological satellites & sensors • Atmospheric sounding • Retrieval of winds • Fog detection using satellite data	
Dr. Asfa Siddiqui	• Basics of Urban and Regional planning • Urban land Use/Land Cover • Renewable/Non-renewable Energy Sources: Solar potential estimation • Hyperspectral RS for urban areas • Thermal RS for Urban Areas • Ambient Air Quality Assessment for Urban Area	
Mr. Pankaj R. Dhote	• Hydrograph analysis • Streamflow measurement • Watershed morphological analysis • Groundwater modelling • Basics of flood hydrology flood peak estimation and routing • Flood mapping, monitoring and modeling	
Dr. Suresh Kannuajiya	• Geodynamics and Seismicity of Himalaya • Active fault imaging in the Foothills of Himalaya • Basics of GNSS satellite and Advanced GPS data processing • Basics GRACE/GRACE-FO satellites and applications in hydrology and other applications • Geophysical Prospecting: • High-Resolution EO data study in the various geological applications	
Mr. Justin George	• Land degradation and watershed management • Fundamentals of soils & pedogenesis • Hyperspectral RS in degradation mapping / Soil spectral / Characteristics	
Dr. Sanjeev Kumar Singh	• Numerical modelling of tropical cyclone • Numerical Weather Prediction • Satellite data assimilation in NWP model	

Name	Topics	Photograph
Mr. Prabhakar Alok Verma	• Geoinformatics • Geostatistics	
Dr. Ishwari Datt Rai	• Phenology for vegetation differentiation • Biodiversity characterisation & conservation priontization • Forest ecosystem structural and functional analysis • Definitions and concepts of Landscape ecology • Forest ecosystem and climate linkages	
Dr. Taibanganba Watham	• Forest inventory concept & Scope • Statistical treatment of forestry inventory data • Wetland habitat monitoring and conservation planning • Forest fire risk zonation and danger rating • Forest productivity estimation and carbon flux monitoring • Fire ecology, Eo-based active fire detection and monitoring , burnt area mapping and recovery assessment	
Mr. Abhishek Danodia	• Agriculture Informatics, • Remote sensing for Agricultural Drought & Water management • Fundamentals & importance to agrometerology • ICT applications in agriculture, Basic of DBMS, SDSS	
Dr. Mamta Chauhan	• Planetary Geology	
Mr. Yateesh Ketholia	• Geomorphology & geomorphic processes • Hydrocarbon resources & mode of occurrences • Landslides & earthquakes	
Dr. Surendra Kumar Sharma	• Machine Learning for urban studies	
Mrs. Jappji Mehar	• Lunar geology • Microwave remote sensing for geological studies	
Dr. Sachiko Mohanty	• Internal wave dynamics • Numeric Ocean Modelling • Ocean circulation and upper oceanic processes • Ocean biogeochemistry.	


B-25
केन्द्रीय भोजनालय
Central Dining Facility


GSLV MKIII
INDIA
INDIA

Pilot Projects of Students

Monitoring Urban Green Space Dynamics in Dhaka Metropolitan Area Using Multi-Temporal Satellite Imagery

Nasir Uddin Khan
Research Assistant
Urban Development Directorate, Dhaka, Bangladesh
Email: nasirraudd2021@gmail.com

Supervisor
Dr. Kshama Gupta, Scientist/Engineer
Urban and Regional Studies Department
IIRS, Dehradun.

A B S T R A C T

Urban green spaces are vital for environmental sustainability, biodiversity conservation, and overall urban well-being, particularly in rapidly expanding megacities like Dhaka, Bangladesh. Traditional methods for monitoring green spaces often face challenges related to cost, frequency, and spatial coverage. This study utilizes Remote Sensing (RS) and Geographic Information Systems (GIS) to develop a spatiotemporal framework for analyzing urban green space dynamics over multiple decades (1995–2025).

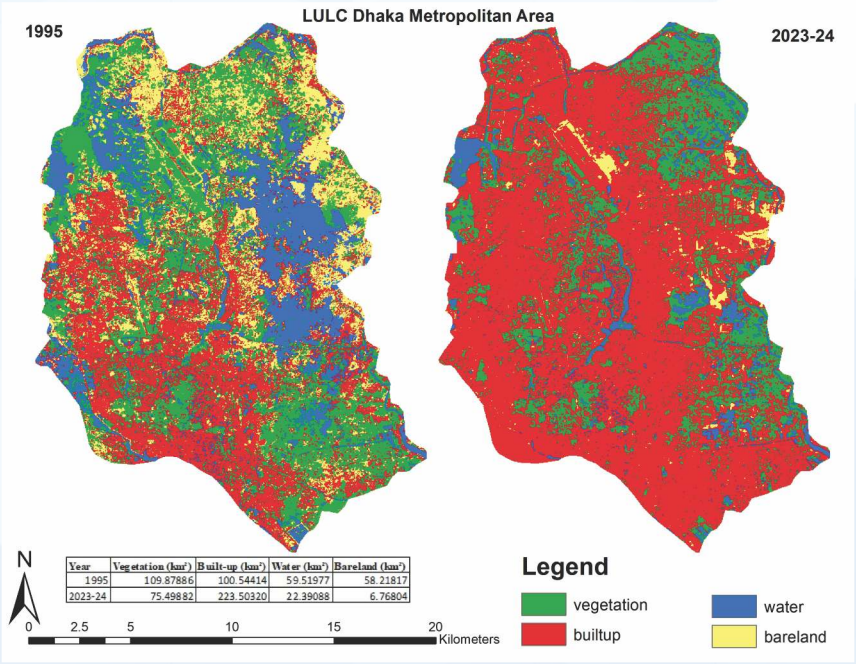


Fig 1: LULC Dhaka Metropolitan Area

Multi-temporal satellite imagery from Landsat and Sentinel-2 is employed to assess changes in urban green cover. The Normalized Difference Vegetation Index (NDVI) is used to quantify vegetation changes over time. Supervised classification techniques, specifically the Random Forest (RF) algorithm, are applied in Google Earth Engine (GEE) to classify land cover based on labeled training data. While RF is a machine learning algorithm, in this study, it is utilized as a supervised classification method to ensure accurate land cover mapping. The integration of GEE for data processing and ArcGIS for spatial analysis ensures efficient large-scale monitoring of urban greenery.

The study examines both seasonal variations and long-term trends in green space distribution across Dhaka's metropolitan area. Preliminary findings reveal significant fluctuations in urban greenery, emphasizing the impact of urbanization and land-use changes. This research provides an effective approach for urban planners and policymakers to assess green space dynamics and support sustainable urban development strategies.

Keywords: Urban Green Space, Remote Sensing, GIS, Supervised Classification, Random Forest, NDVI

Identification of Potential Fishing Zone (PFZ) along Kerala coast, India

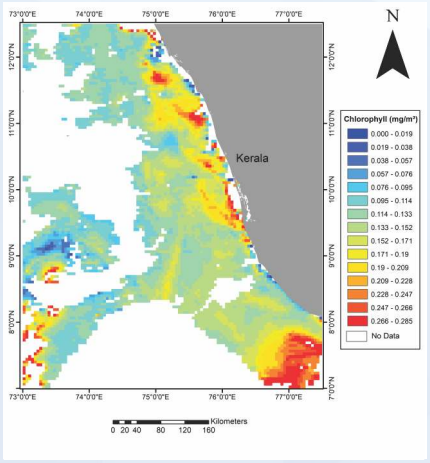
Mr. Md. Abdur Rahman-Al-Mamun
Scientific Officer,
Bangladesh Space Research and Remote Sensing Organization (SPARRSO), Dhaka-1207, Bangladesh.
Email: rahman.almamun@sparrso.gov.bd

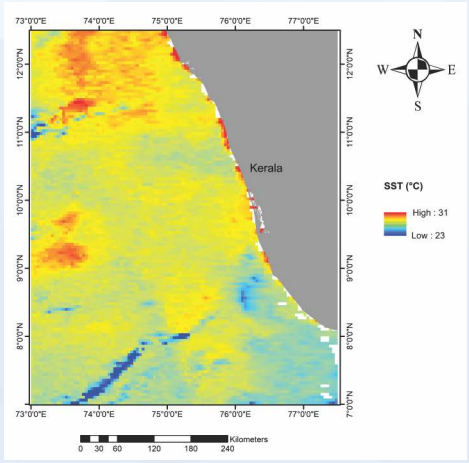
Supervisor (S)
Dr Sachiko Mohanty, Scientist/ Engineer 'SE'
Dr. Debashis Mitra, Group Director and Scientist/ Engineer G
Marine Science Department,
Marine and Atmospheric Science Group, IIRS, Dehradun.

India has about 8100 km coast surrounding three sides of the country and approximately 7 million of people live along the coastline. Most of the people lead their livelihood through fishing and similar profession relevant to fishing and fisheries. As technology has changed and parameters that refers fish existence can be identified by remote sensing technique using satellite sensor data. Identification of potential fishing zone with the aid of remote sensing technology is a crucial need for the fisher flocks to get profitable catch by less fuel consumption, effort and time as well. In this study, two different parameters chlorophyll concentration and sea surface temperature (SST) were taken from satellite-derived data. For this purpose, Aqua MODIS data was used for chlorophyll concentration and NOAA AVHRR data was used for SST extraction. The chlorophyll concentration in deep sea area is 0.2 mg/m3 to 0.3 mg/m3, however, at the close of Kerala coast the chlorophyll concentration is around 0.4 mg/m3. For sea surface temperature, the obtained range is from 21 °C to 31 °C. Using SST and Chlorophyll, the potential fishing zone (PFZ) is mapped over the Kerala coast. The validation of the result was done by Indian National Centre for Ocean Information Services (INCOIS) and found the catch amount of a PFZ notified area is 2 to 6 times more than fishing at un notified fishing area and the amount of extra profit was recorded 2 to 7 times more. This research might contribute to the improvement of the economy and foreign earning.

Keywords: PFZ, SST, Chlorophyll, MODIS, AVHRR

(a)





(b)

Fig.1: Spatial distribution of (a) chlorophyll and (b) SST along the Kerala coast on 24 January 2007

GIS-Based Route and Site Suitability Analysis for Enhancing Last-Mile Delivery in Dehradun City

Ms. Jallu Madhubhargavi
Student
Andhra University
Email: madhubhargavi620@gmail.com

Supervisor
Mr. Kapil Oberoi, Scientist/Engineer – SF
Geoinformatics Department, IIRS, Dehradun.

ABSTRACT

Instant delivery platforms like Zepto and Blinkit has revolutionized urban logistics by offering ultra-fast deliveries, enhancing significantly customer convenience and also streamlining last-mile operations. The business model of such services are powered by geospatial technology by allowing users to place order online as well as helping service provider to deliver users order(s) at their door steps. This study aims at enhancing & optimizing last-mile delivery networks by utilizing geospatial technology for tackling key challenges related to route planning and resource allocation. Focusing on Dehradun city, this study evaluates the instant delivery network of an e-grocery company including identifying inefficiencies in last-mile delivery. GIS based network analysis was performed to optimize delivery routes so as to minimize travel time including identifying optimal sites for setting-up new warehouse. Service areas of warehouse locations were carried out using road network with 10-minute travel time as an impedance factor along with incorporating historical traffic trends to ensure accurate accessibility analysis and delivery efficiency. Further site suitability analysis by using Analytic Hierarchy Process (AHP) algorithm is performed to determine optimal locations considering the factors such as future expansion of city, land use patterns, and demographic distributions. The outcome is a robust framework for optimizing urban last-mile delivery networks under defined spatial conditions. By prioritizing structured, data-driven optimization, this study provides a foundational approach that can be adapted to similar delivery systems in other urban environments. The study's insights underscore the potential of GIS and RS in enhancing last-mile delivery, helping to bridge the gap between logistical challenges and efficient solutions while offering practical insights to improve last-mile delivery.

Keywords: Last-mile delivery, E-commerce, Network Analysis, Route Optimization, Service Area Analysis, Network Dataset

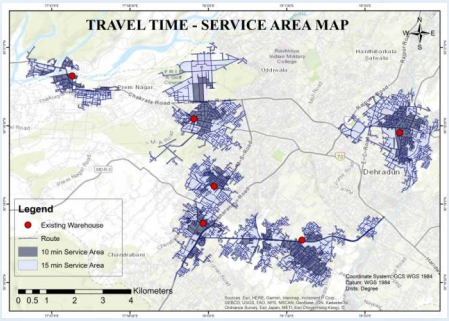


Fig. 1: Service Area Analysis by travel time

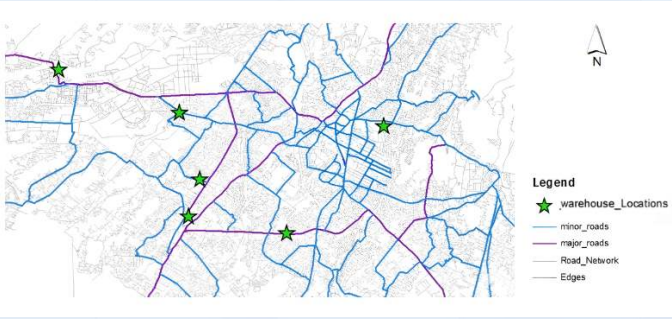


Fig. 2: Study area

Ship Detection using SAR Datasets

CDR Surendra Rawat
Indian Navy
Email: sierraromeo100487@gmail.com.

Supervisor
Dr. Shashi Kumar, Scientist/Engineer –'SF'
PRSD, IIRS, Dehradun.

ABSTRACT

Satellite based Synthetic Aperture Radar datasets owing to their unique capabilities in providing detailed, high-resolution images of the Earth's surface, regardless of weather conditions, time of day, play a critical role in enabling maritime surveillance. The interaction of radar signals from a satellite-based SAR with the ship's hull/ superstructure, primarily due to double bounce scattering causes substantial backscatter of the waves as compared to sea surface, which due to specular reflection has almost negligible backscatter. This substantial backscatter from a ship makes it stand out from the surrounding sea surface in a SAR imagery as a cluster of bright pixels, even in rough seas or challenging environments. Therefore, by using certain ship detection tools, SAR datasets enable Maritime Security Agencies in ship detection, pinpointing their location, approximate dimensions and thus provide actionable information for optimally channelizing their surveillance efforts using land, sea and air based platforms, to investigate the identified suspected targets.

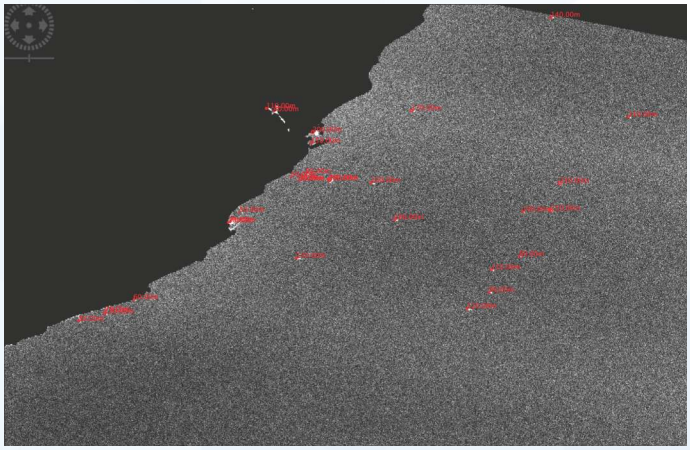


Fig. 1: Ship Detection Off the Coast of Vizag using OOD (SNAP)

This project aims to carry out ship detection off Vizag/ Mumbai harbour. The Ocean Object Detection tool provided by SNAP (Sentinel Application Platform) and Vessel Detection System (VDS) provided by ship detection tool, SUMO (Search for Unidentified Marine Objects), an open-source tool for the purpose designed by JRC, have been utilized in this project for ship detection. Both of these tools are pixel-based algorithm which employ a structured approach, including the use of land masks to restrict the search to be undertaken over sea area of the SAR image and thus precluding the possibility of false alarms over land area. The algorithms involved carry out statistical calculations of local background clutter, generation of a local threshold value, identification of pixels having higher values than the local threshold and finally clustering of such pixels to form the plausible target. A reliability value is associated to each detected object indicating probability of the target being a ship. Also, various attributes of the detected targets viz length/width and heading are calculated to give a description of ship's characteristics. This paper aims to explore the feasibility of ship detection using Sentinel-1 fine dual-pol acquisitions over Mumbai/Vizag harbour and analyse the results obtained.

Keywords: Ship Detection, Sentinel 1, SAR, SNAP, SUMO

Improvement of Dem Vertical Accuracy using Space-borne Lidar

Wg Cdr KS Sudharshanan
Indian Air Force
Email: ksseee@gmail.com

Supervisors:
Dr. Shefali Agrawal, Scientist/Engineer – 'G'
Group Director, GTOP IIRS, Dehradun.
Dr. Hina Pande, Scientist/ Engineer – 'SG'
Photogrammetry and Remote Sensing Department, IIRS, Dehradun
Mr. Ashish Joshi, Scientist/ Engineer – 'SF'
Photogrammetry and Remote Sensing Department, IIRS, Dehradun

Digital Elevation Models (DEMs) are widely used in geospatial applications like flood modeling, infrastructure planning, aviation, environmental monitoring etc. The accuracy of Digital Elevation Models (DEMs) is critical for these applications; however, vertical accuracy of the open-source DEMs often falls short of precision required. Though, corrections over small areas could be done through Ground Control Points, it becomes a challenging task for larger areas, inaccessible terrains like undulating hilly areas, thick forests where it is difficult to obtain GCPs. The space-borne LIDAR (Light Detection and Ranging) has opened up new avenue to obtain location data with high precision and high density which could be effectively utilized for improving the DEM elevation accuracy.

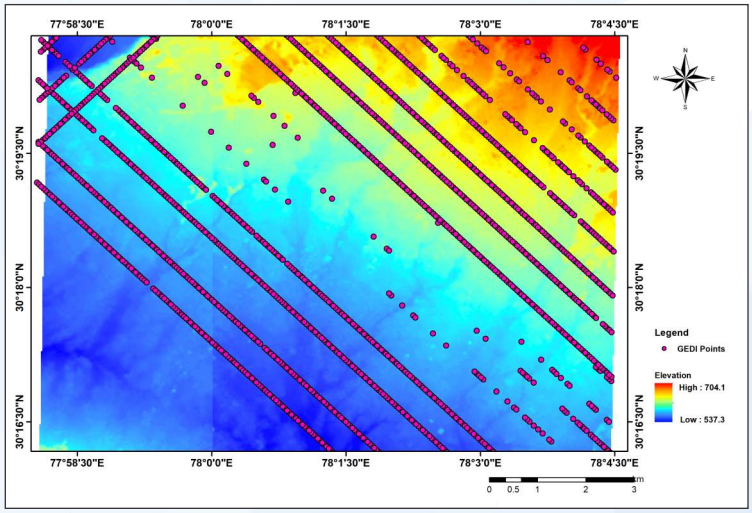


Fig. 1:GEDI Points Overlapped on Study Area-Dehradun

The study focuses on assessment and integration of space-borne LiDAR data from Ice, Cloud and land Elevation Satellite-2 (ICESAT-2) and Global Ecosystem Dynamics Investigation (GEDI) with existing CARTOSAT-1 DEM 30M resolution, utilizing advanced processing techniques to minimize vertical discrepancies. A comprehensive accuracy assessment was conducted by comparing ICESat-2 LiDAR data and CARTOSAT-1 DEM with high-precision GNSS (Global Navigation Satellite System) measurements obtained through field surveys. The results has shown ICESat-2 has RMSE (Root Mean Square Error) of ~1.2m for vertical accuracy highlighting the superior accuracy of ICESat-2 data.

Based on these observations, a methodology was developed to integrate ICESat-2/ GEDI elevation data with CARTOSAT-1 DEM using Python, advanced filtering and interpolation techniques to enhance vertical accuracy. The results have shown an improvement in vertical accuracy of 68% for flat regions and 52% for hilly regions. This study highlights the potential of space-borne LiDAR as a transformative tool for vertical accuracy refinement and contributes to improve DEM quality for scientific and practical applications.

Keywords: DEM, accuracy improvement, CARTOSAT-1 DEM, ICESAT-2, GEDI

Urban Feature Extraction from Cartosat 2E Satellite Data Using Machine Learning

Wg Cdr Raj Kumar Maurya
Aeronautical Engineer (Electronics)
Indian Air Force
Email: rajmaurya5@gmail.com

Supervisor
Dr. Kamal Pandey, Scientist/Engineer – 'SE'
GITDL Department, IIRS, Dehradun

ABSTRACT

Urban feature extraction from satellite imagery is essential for effective urban planning, infrastructure development, and environmental monitoring. Traditional methods rely on manual interpretation, which is time-consuming and less efficient. With advancements in Remote Sensing and Machine Learning (ML), automated techniques now enable high-accuracy feature extraction. This study leverages high-resolution Cartosat 2E satellite imagery and ML algorithms to identify urban features such as buildings and roads. The goal is to develop a model that efficiently classifies areas as urban or non-urban, enhancing automation in urban analysis. The methodology involves pre-processing steps such as image enhancement and normalization, followed by the application of machine learning algorithms. Initially, ground truth points were collected from the Cartosat-2E satellite image, with buildings and roads classified as urban points, while features like water bodies, vegetation, fallow land, and forests were categorized as non-urban points. Reflectance values from all four bands of the satellite image were extracted for these ground truth points, and an additional feature, Spectral Index (NDVI), was incorporated. Different ML algorithms such as Decision Tree, Random Forest and Support Vector Machine were used to train the model and differentiate between urban and non-urban area for the city Rishikesh. The model's performance was evaluated using accuracy metrics such as precision, recall, and F1-score, which were 0.99, 0.99, and 0.99, respectively, indicating an overall accuracy of 98.53%. The highest accuracy was observed in the RF-based ML model. The model was tested on Dehradun city, achieving an accuracy of 88.53% and a Kappa coefficient value of 0.77.

This project demonstrates the potential of ML in automating urban feature extraction from high-resolution satellite imagery, offering a scalable solution for large-scale urban monitoring and management. The findings highlight the importance of integrating ML with remote sensing technology, enabling efficient urban planning and sustainable development.

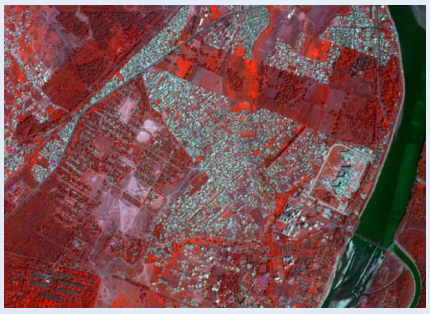


Fig.1 : Cartosat 2E image of Rishikesh

Fig. 2: Urban features extracted using ML model

Keywords: Decision Tree, Random Forest, Support Vector Machine, Cartosat 2E

Geospatial Analysis of the Spring Floods of April 2024 in parts of the Ural River basin in the Western Region of Kazakhstan

Mrs. Moldakhmetova Perizat
Aircraft control engineer
Remote Sensing Department

Supervisor
Scientist SG
Mr. Chandra Mohan Bhatt
Disaster Management Studies

A B S T R A C T

Spring floods represent a significant natural hazard in the Ural River Basin, particularly in the western region of Kazakhstan, where snowmelt and heavy rainfall contribute to river overflow. The flood of April 2024 had a serious impact on agricultural lands, infrastructure, and ecosystems in the region, highlighting the need for modern geospatial technologies to assess its scale and consequences.

This study utilizes multi-temporal Sentinel-1 and Sentinel-2 satellite images to analyze flood extent and its impact on land use and land cover (LULC). Thresholding technique was utilized to map the floods from Sentinel-1 SAR data whereas Normalized Difference Water Index (NDWI) technique was applied to extract field inundation areas from optical image of Sentinel-2.

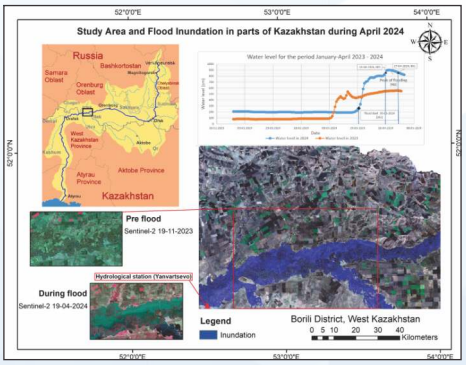


Fig.1: Study Area and Flood inundation in parts of Kazakhstan during April 2024

Land use/Land Cover (LU/LC) map was prepared using unsupervised classification for the flood affected area using Sentinel-2 data. Results indicate that approximately 32% pastureland and 10% of cropland was impacted. The analysis of NDVI changes between 2023 and 2024 suggest the flooding had negative impact on the cropland whereas the pastureland which requires high moisture did not had much impact.

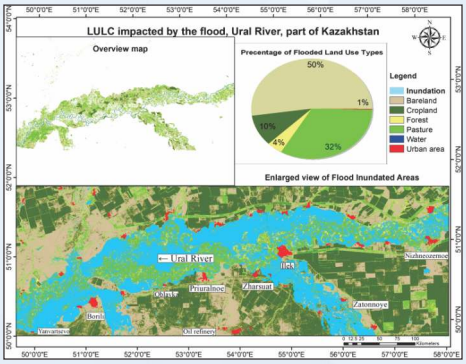


Fig.2: LULC impacted by the Flood, Ural Rive, part of Kazakhstan

From the time series Sentinel-2 data it is observed that the study area was under snow cover between November to March end, 2024. Meteorological observations indicate that winter snowfall accumulation in 2024 was significantly higher than in 2023, leading to increased runoff. Hydrological data was obtained from Kazhydromet for temperature, precipitation, water level for 2023 and 2024 for validation. The data shows that there was sudden rise in both minimum and maximum temperatures. The increase has been significantly higher as compared to 2023, which may have led to melting of the snow and subsequent rise in river water levels. The water level data also synchronizes with the temperature and satellite observations and show corresponding rise in water level from 261 cm in March 30 and peaking to a high of 902 cm in April 21 and then receding further onwards.

This geospatial analysis highlights the effectiveness of remote sensing and GIS-based approaches in flood monitoring and land impact assessment. The findings provide critical insights for flood risk management and climate adaptation strategies in the region.

Keywords: Sentinel-2, NDWI, Flood Inundation, LULC, Unsupervised Classification, Ural River Basin, Kazakhstan, Multi-Temporal Analysis

Assessment of Agricultural Drought Using Earth Observation Satellite and Pasture Yield Statistics

Ms. Mungunchimeg Nasanbat
Engineer, Information and Research Institute of Meteorology, Hydrology and Environment, Mongolia
Email: mnasanbat1@gmail.com

Supervisor
Mr. Abhishek Danodia, Scientist/Engineer – 'SD'
Agriculture and Soil Department, IIRS, Dehradun.

Drought is a recurring natural phenomenon that significantly impacts agricultural productivity, particularly in regions like Mongolia, where 76% of the land area is covered by pasture. This study aims to assess agricultural drought in Mongolia using remote sensing data and GIS techniques to monitor the effects of drought on pasture health and yield.

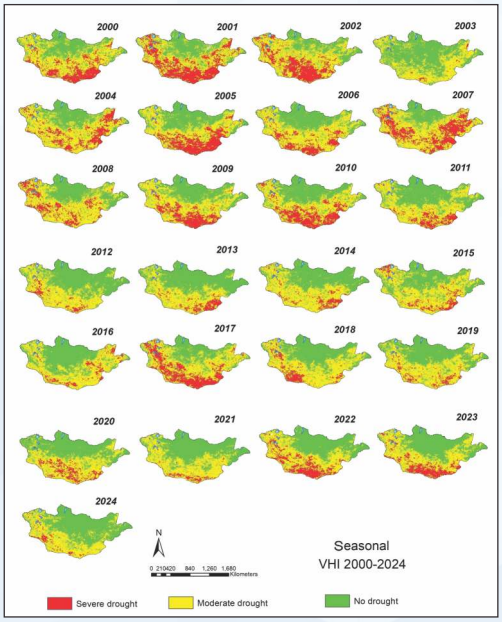


Fig.1: Seasonal VHI representation from 2000 to 2024

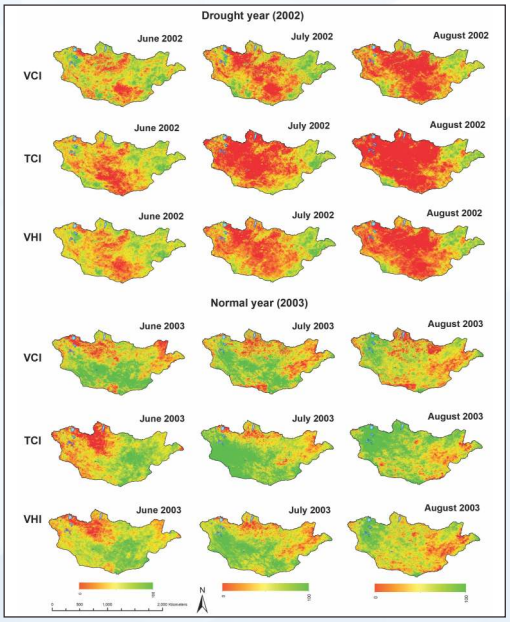


Fig. 2: Spatio-temporal distribution of VCI, TCI, and VHI for the drought year (2002) and normal year (2003)

MODIS NDVI and LST data from 2000 to 2024 (April to October) were utilized to track drought conditions over time. The Vegetation Condition Index (VCI) and Temperature Condition Index (TCI) were derived from long-term satellite data and the Vegetation Health Index (VHI) was subsequently calculated. High NDVI values correlate with healthy vegetation, while elevated LST values signal vegetation stress. In addition, statistical analysis of forage yield data from 1360 plots across Mongolia, collected over the past 18 years, will be performed to further evaluate the relationship between drought and pasture productivity.

The results show that Mongolia has been severely affected by drought, with the most intense years occurring in 2001, 2002, 2007 and 2017. In contrast, normal years included 2003 and 2021. By comparing the years 2002 and 2003, the differences between drought and normal years can be examined for each index. The correlation between VHI and pasture yield statistics ranges from 0.18 to 0.52, indicating a moderate relationship between vegetation health and pasture productivity in the studied regions.

Keywords: Drought, Pasture Yield, VCI, TCI, VHI

ABSTRACT

Potential Land Use Conflict Identification in Bulgan province, Mongolia using Geospatial Techniques and MCDM

Ms. Perliimaa Gantumur
Student, IIRS
Email: gantumur1perliimaa@gmail.com

Supervisor
Dr. Kamal Pandey, Scientist/Engineer-SF
Geo-web Services, IT and Distance Learning Department, IIRS

Co Supervisor
PhD. Bazarkhand Ts, Scientist
Department of Geography, NUM, Ulaanbaatar, Mongolia

A B S T R A C T

In recent years, conflicts of interest over land use have been arisen between many parties after the adoption of the land law and major policies in Mongolia. In addition, meeting current social needs without compromising future sustainability is one of the challenges facing field of land management and the Mongolian government. The main objective of the study is to identify potential land use conflicts between different land uses by assessing the land use suitability using Geospatial techniques and MCDM. By integrating Geospatial techniques with MCDM, decision-makers can systematically assess suitable land uses, predict conflicts, and develop sustainable land management strategies that balance economic, social, and environmental needs. The study area is 2,259,821.85 hectares, located in the central part of Mongolia (48.25N, 103.55E), in a forest-steppe region with diverse natural resources.

First, we assessed the suitability of three main types of land use: pasture-livestock land, ecological sensitive sites, and construction land. Subsequently, based on the land use conflict identification strategy (LUCIS), potential land use conflicts were identified. The results of the study showed that 34.71% of the study area has potential land use conflicts, 0.08% is unsuitable for land use, and 65.21% is dominant areas.

Major conflicts, three types of land use overlap with equal intensity, consist of 9.09%, the largest area of land use conflict occurred between pasture and ecological land, accounting for 63.3% in conflict areas. On the contrary, the lowest area of land use conflict was determined between ecological land and construction land, covering only 3.29%. Pasture and construction conflict areas include 24.28% in conflict areas.

Keywords: Land use conflict, land use suitability, LUCIS, Geospatial technique, MCDM

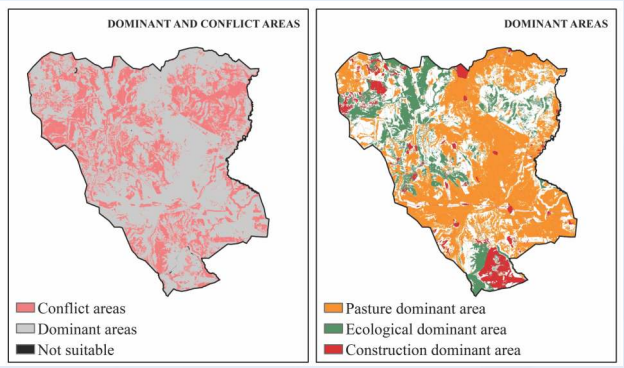


Fig. 1: Distribution of dominant and potential conflict areas

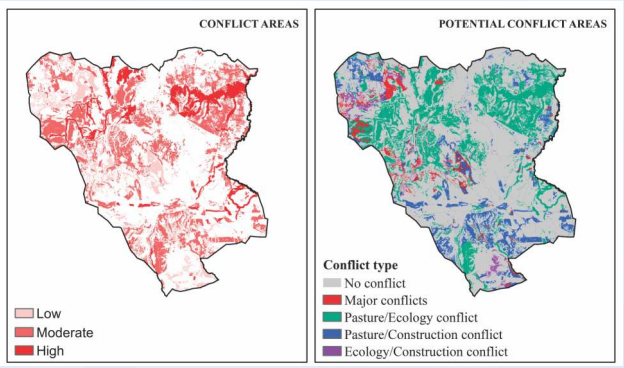


Fig. 2: Distribution of land use conflict intensity and type

Examining the Effect of Representative Sampling in Fuzzy ML Model: A Case Study in Water Bodies and Gold Mining Sites

Mrs Suvd-Erdene Tseyeregzen
Synoptic Engineer & Weather Forecaster
Hydrometeorology and Environmental Monitoring Center
Govi-Altai province Mongolia.
Email: tssuvd55@gmail.com

Supervisor
Dr. Anil Kumar, Scientist, SG
Photogrammetry Remote Sensing Department, IIRS,
Dehradun

The Zaamar district in Mongolia features diverse water bodies, shaped by both natural hydrological processes and extensive gold mining activities. These include rivers, ponds, and artificial reservoirs, all significantly impacted by placer gold mining. As a key gold-producing region, Zaamar's mining operations contribute to economic growth but also introduce environmental risks. Mining activities disturb riverbanks and groundwater, leading to the creation of new water bodies with varied chemical compositions. These changes threaten local biodiversity and water availability. Moreover, both artisanal and industrial mining practices cause fluctuations in water levels and sedimentation, further complicating the hydrological landscape. To reduce these environmental impacts while continuing economic development, sustainable water management practices are crucial. Efforts to restore damaged areas, establish regulatory frameworks, and adopt innovative mining techniques are essential to balance resource extraction with ecological preservation. Understanding how mining activities interact with the district's diverse water bodies is key to developing strategies that minimize harm and support long-term sustainability.

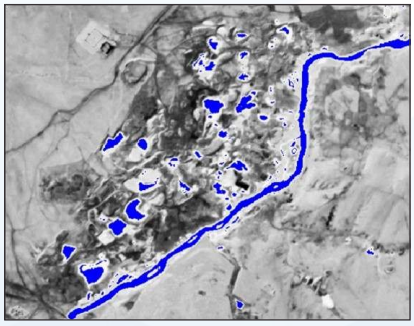


Fig. 1: Heterogeneous water bodies mapped using ISM training concept

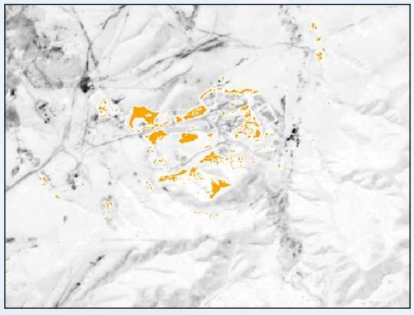


Fig. 2: Heterogeneous Gold Mines mapped using ISM training concept

In the context of mining, the 'Individual Sample as Mean' training approach uses image-based identification to improve learning, safety, and efficiency. By engaging trainees with visual samples, this approach enhances their understanding of mining equipment, geological formations, hazard identification, and safety protocols. It also improves knowledge retention, reduces the risk of errors, and minimizes workplace accidents. Additionally, it helps address the heterogeneity of water bodies and gold mining areas by ensuring each sample is equally weighted.

The modified possibilistic c-means model integrates advanced technologies like AI, automation, and remote sensing, optimizing resource extraction while minimizing waste and environmental harm. These technologies enhance real-time decision-making, safety, and environmental sustainability. The approach successfully manages uncertainty in data classes, while the 'Individual Sample as Mean' technique accounts for variations in water bodies and mining areas, as observed through low variance in the outputs.

Keywords: Waterbodies, Goldmining area, fuzzy, c-means

ABSTRACT

Spatiotemporal Surface Water Quality Mapping and Monitoring Using AI/ML in Yangon Region, Myanmar

Mr. Si Thu Myo Aung
Assistant Director, Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation
Email: sithuecd@gmail.com

Supervisor
Dr. Vaibhav Garg, Scientist/Engineer – 'SF'
Water Resources Department, IIRS, Dehradun.

A B S T R A C T

Water quality is a critical environmental and public health concern, particularly in rapidly urbanizing regions such as Yangon, Myanmar. Traditional water quality monitoring methods are often constrained by cost, time, and limited spatial coverage. This study leverages Artificial Intelligence (AI) and Machine Learning (ML) techniques, integrated with Remote Sensing and GIS, to develop a spatiotemporal water quality mapping and monitoring framework.

Multispectral satellite imagery from Sentinel-2 is utilized to extract spectral indices (NDTI, NDCI, MNDWI), principal component bands and band reflectance values. In-situ measurements of turbidity and other key water quality parameters serve as ground truth data for training and validating AI/ML models, including Random Forest (RF), linear regression, and polynomial regression algorithms. The operational workflow is designed to be efficient and scalable, utilizing Google Earth Engine (GEE) for rapid satellite data processing, Python for AI/ML model development and statistical analysis, and ArcGIS for spatial visualization and mapping. These tools significantly reduce processing time and enhance analytical capabilities, making large-scale water quality monitoring more accessible and effective.

Spatiotemporal mapping is conducted to assess seasonal and long-term variations in surface water quality across different water bodies in Yangon. Preliminary results demonstrate that ML models can predict water quality parameters with high accuracy for turbidity and pH, highlighting their potential for large-scale, cost-effective, and continuous monitoring. This study provides an efficient approach for environmental agencies to dynamically assess water quality and support sustainable water resource management.

Keywords: Water Quality, GEE, AI/ML,RF, Spectral Indices, PC bands

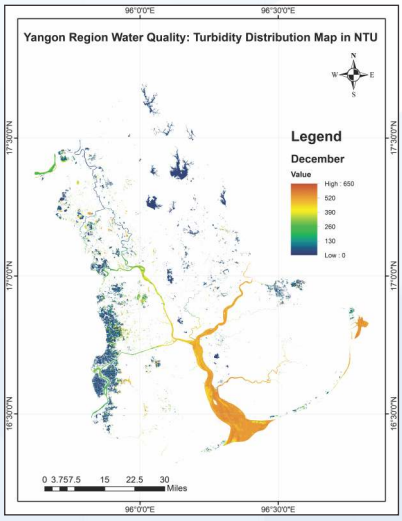


Fig. 1: Turbidity Levels in December 2024

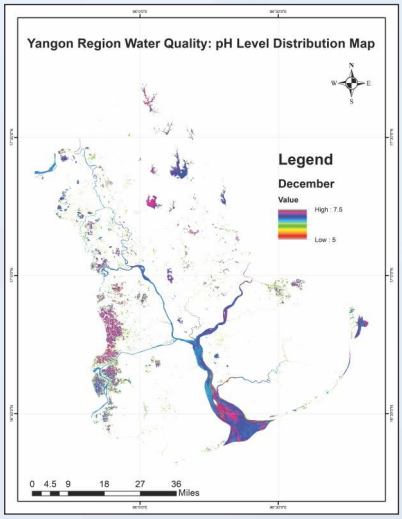


Fig. 2: pH Distribution in December 2024

Remote Sensing-based Flood Analysis in Myanmar using SAR and Optical Data; A Case Study of Irrawaddy River Basin, Myanmar

Mr.Ye Min Htay
Myanmar Aerospace Engineering University
Email: ye0071251986@gmail.com

Supervisor
Mr. Ashish Joshi, Scientist/Engineer-SF,
Photogrammetry and Remote Sensing Department, IIRS

Flooding is one of the most frequent and devastating natural disasters, impacting communities, infrastructure, and livelihoods. This study focuses on flood hazard assessment in the Magway region, Myanmar, particularly along the Irrawaddy River, which is prone to recurrent flooding. Using remote sensing techniques, flood inundation maps were generated through a combination of SAR (Sentinel-1) and optical (Sentinel-2) data for the year 2024. Water pixels were extracted from SAR data through calibration, Speckle filtering, terrain correction, and backscatter analysis, while optical data was processed using the Normalized Difference Water Index (NDWI) and thresholding techniques. The generated flood maps were integrated with administrative boundaries, including basin, district, and village levels, to assess spatial patterns of inundation.

The study provides valuable insights for disaster management authorities, enabling informed decision-making for flood risk mitigation and evacuation planning. The application of multi-temporal remote sensing data and geospatial analysis demonstrates the potential of advanced technologies in flood hazard assessment and resilience planning. This study provides valuable insights for disaster management authorities, facilitating informed decision-making for flood risk mitigation and evacuation planning.

Keywords: Flood hazard, Remote Sensing, Google Earth Engine, SAR, Optical Data

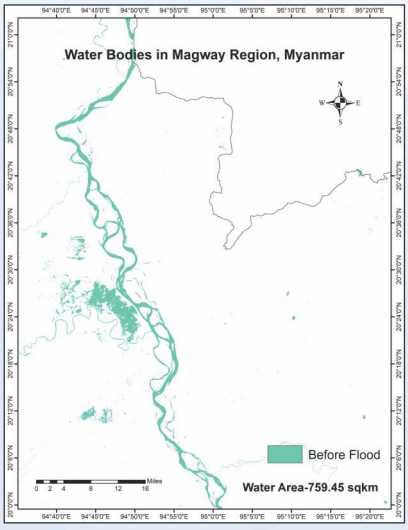


Fig.1: before flood Magway

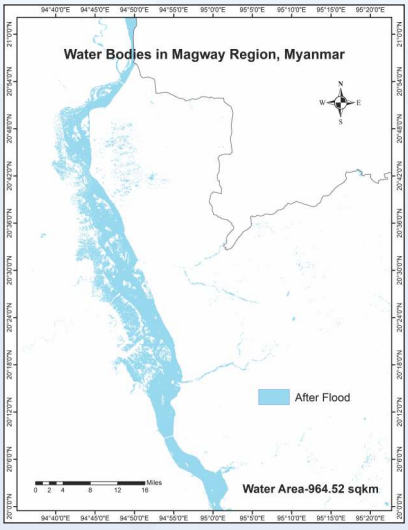


Fig. 2: after flood Magway

ABSTRACT

Understanding the Landscape Fragmentation Status and Recovery Trends of Nepal

Ms. Babita Neupane
Institute of Forestry, Pokhara Campus,
Tribhuvan University, Nepal
Email: babita@iofpc.edu.np; Neupane.babita25@gmail.com

Supervisor:
Dr. Taibanganba Watham
Researcher/ Scientists
Forestry and Ecology Department, IIRS, Dehradun

A B S T R A C T

Forest fragmentation breaks large contiguous forest land into smaller isolated patch by human-induced and natural factors ultimately weakening the connectivity. This has become a global issue. In Nepal, forest cover has increased from 41.69% to 46.08% between the years 2000 and 2022, driven by various conservation and management initiatives. To enhance conservation effectively and encourage local participation, Nepal has established and/or handed over twenty Protected Areas, eleven Protected Forests, thirty-one Collaborative Forests, and various other forest types to local communities. Therefore, this research explores how these diverse management approaches are contributing to improve the connectivity among isolated forest patches. Multi temporal Land Use Land Cover (LULC) map of Nepal for 2000, 2010 and 2022 were analyzed along with shape file of all twenty Protected Areas, eleven Forest Conservation Areas of Nepal and seven Collaborative Forests of Lumbini Province. The fragmentation index was calculated using Guidos ToolBox, and a 5-kilometer buffer around protected areas was created to assess their impact on reducing forest fragmentation. Result indicated that forest continuity has increased from 81.53% in 2000 to 91.32% in the year 2010 but decreased marginally to 88.67% in 2022. Likewise, among 20 Protected Areas the highest connectivity of 91.95% was observed in National Parks in 2022 whereas lowest connectivity of 33.44% was observed in Koshi Tappu Wildlife Reserve (only wildlife reserve of Nepal) in 2020. However, within the 5 km buffer area highest connectivity of 83.66% was observed in the Koshi Tappu Wildlife Reserve in 2010. About other management regime, continuity in Collaborative Forest of Lumbini Province was observed highest in 2022 of about 95.18% whereas continuity in Forest Conservation Areas of whole Nepal was limited to 85.33%. Since this research gives only the preliminary result, further research on different protected areas and forest management regime is essential to identify the most effective strategies for improving connectivity and reducing fragmentation in Nepal.

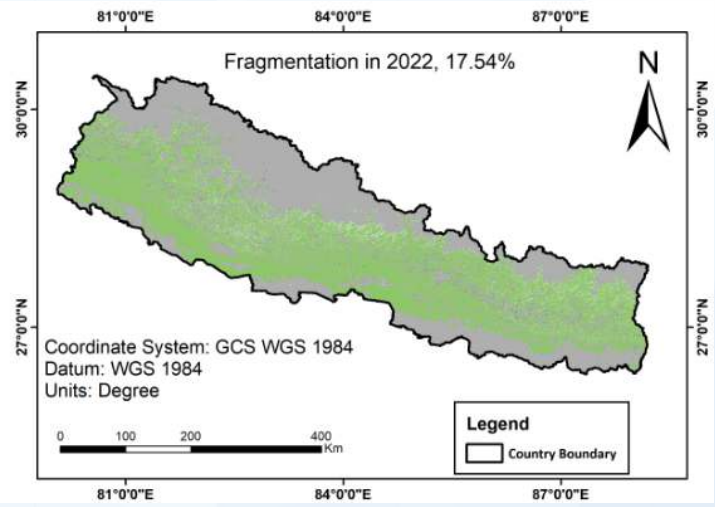


Fig. 1: Fragmentation in National Park and whole Nepal in the year 2022

Key Words: Connectivity, Management, Protected Areas, Collaborative Forest, Forest Conservation Area

Understanding the Hydrological Response of Norwood Watershed using Modelling Approach

Mr. S.J.C. Sandaruwan
Engineering Assistant,
Irrigation Department Sri Lanka
Email: sjcsandaruwan@gmail.com

Supervisor
Mr. Pankaj R Dhote, Scientist/Engineer – SE

The Norwood Watershed, located upstream of the Kelani River in Sri Lanka, has played a crucial role in water resource management, flood control, and environmental conservation for the local community. Understanding its hydrological behavior has been essential for effective water allocation and flood mitigation. This study has aimed to develop a hydrological model using HEC-HMS to simulate runoff and streamflow responses. The model has integrated Digital Elevation Models (DEMs), land use/land cover (LULC) maps, and hydrologic soil groups (HSG) to estimate runoff using the SCS-CN method and the SCS Unit Hydrograph. Following watershed delineation and parameter definition, the model has been used to simulate discharge under different rainfall datasets. Discharge has been simulated for the southwest monsoon using historical rainfall records from rain gauge stations, ERA5 reanalysis data, GPM, and CHIRPS datasets. Statistical metrics, including Root Mean Square Error (RMSE) and the Coefficient of Determination (R^2), have been employed to assess the reliability of different rainfall sources. Additionally, the study has estimated peak discharge in the river during extreme rainfall events. The findings have provided valuable insights for flood management, water resource planning, and the selection of appropriate rainfall datasets for hydrological modelling.

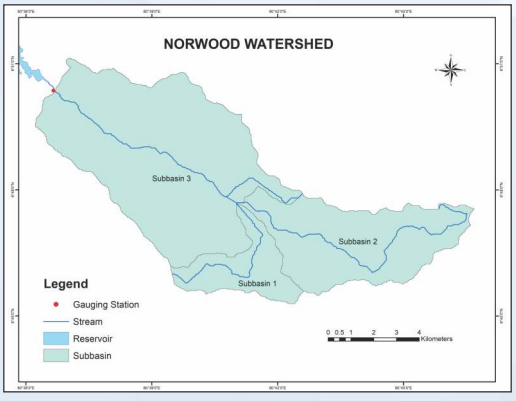


Fig. 1: Norwood Watershed

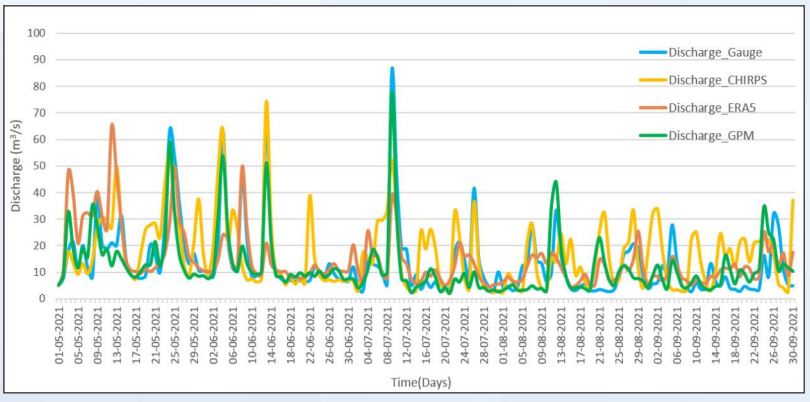


Fig. 2: Simulated Discharge using various Rainfall Datasets

Keywords: Rainfall, Discharge, LULC, HSG, HEC-HMS

ABSTRACT

LiDAR Technology and Orthoimage for 3D Building Extraction: A Comprehensive Approach for Solar PV Potential Estimation

Mrs. P. Mahesha Prasanjali Chandrasekara
Remote Sensing Technological Officer,
Survey Department
Email: maheshaprasanjali@gmail.com

Supervisor
Dr. Poonam S. Tiwari, Scientist/Engineer – 'SG'
GITDL Department, IIRS, Dehradun.

A B S T R A C T

As urbanization expands, the need for renewable energy solutions has become increasingly critical. Solar photovoltaic (PV) systems offer a sustainable energy alternative, but accurate rooftop identification is essential for optimizing solar potential. This study leverages LiDAR technology and orthoimage for 3D building extraction and solar PV potential estimation in a selected part of Colombo, Sri Lanka.

The methodology deals with processing UAV LiDAR data to generate surface models, enabling precise building footprint extraction. High-resolution orthoimages further enhance feature detection, ensuring spatial accuracy. Building extraction techniques involve 3D model generation to refine rooftop identification. Slope and aspect analysis are performed to assess panel orientation, while solar irradiation modeling using ArcGIS Solar Analyst determines the energy generation potential. The Ground Coverage Ratio (GCR) method is applied to optimize panel spacing and maximize efficiency.

Expected outcomes include high-resolution 3D building models, precise rooftop area calculations, and solar PV feasibility assessments. The study highlights the efficiency of remote sensing and GIS-based methodologies for urban energy planning. By integrating ArcGIS Pro, LiDAR, and solar modeling techniques, this approach provides an automated, scalable solution for solar PV deployment, contributing to sustainable energy development in Sri Lanka.

Fig. 1: 3D Building Extraction

Fig. 2: Solar Radiation

Keywords: LiDAR, Orthoimage, 3DBuilding Extraction, Solar PV Potential

Reservoir Sedimentation Assessment Using SAR Data

Mr. M.V. Imantha Supun Gunasekara
Aerial Photography Technological Officer,
Survey Department, Sri Lanka
Email: imantha.tc@gmail.com

Supervisor
Dr. Vaibhav Garg, Scientist/Engineer – 'SF'
Water Resources Department, IIRS, Dehradun

Reservoir sedimentation has become a major challenge in maintaining reservoir capacity, leading to several significant impacts, including reduced storage capacity, disruption of dam operations, water quality degradation, and an increased risk of flooding. To understand these impacts, it is essential to assess reservoir sedimentation.

This study focuses on the Senanayake Reservoir, Sri Lanka, and the country's largest reservoir, which was constructed in 1953. Conventional methods for assessing reservoir sedimentation are often costly and time-consuming. However, remote sensing techniques offer an efficient alternative. Both optical and microwave remote sensing can be used for this purpose, but optical remote sensing has limitations due to cloud cover, particularly during the monsoon season when the reservoir area is frequently covered. In contrast, SAR data provide a feasible solution, as microwave signals can penetrate cloud cover, and water surfaces exhibit specular reflection, making it easier to identify water pixels.

In this study, Sentinel-1 SAR imagery was used to assess sedimentation. SAR images were downloaded from the Copernicus Open Access Hub and pre-processed to extract water pixels. Water areas corresponding to different water levels were then calculated, and the volume from trapezoidal formula assumed the shape of the area between two water levels as trapezoid. The analysis of this capacity over time revealed a lower capacity than the reservoir's initial capacity, indicating sediment deposition.

This method provides an effective approach to analysing sedimentation deposition trends in reservoir management. Compared to conventional techniques, remote sensing-based assessment is faster, more cost-effective, and enables frequent monitoring of sedimentation dynamics.

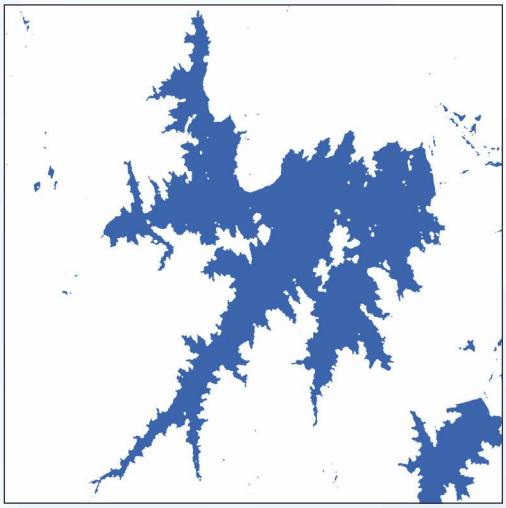


Fig 1: Water Pixel Extraction From SAR Image

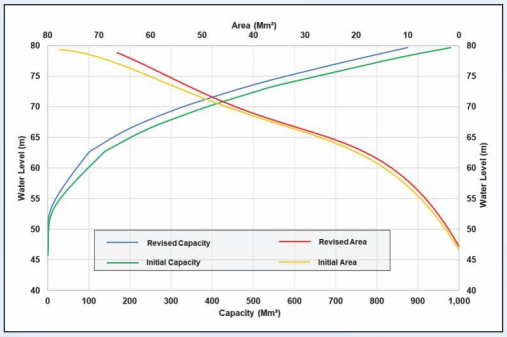


Fig 2: Area Capacity Curve of Senanayake Reservoir

Keywords: Water Body Extraction, Sedimentation, Water Level, SAR, Microwave

Snow and Glacier Dynamics Study of Upper Muksu River Basin Using Remote Sensing and Modeling Techniques

Mr. Homidov Bahrom Anvarovich
Specialist in Hydrometrology of Tajikistan
Email: homidzoda2002@gmail.com

Supervisor
Mr. Praveen K. Thakur, Scientist/Engineer – SG & Head
Water Resources Department, IIRS, Dehradun.

A B S T R A C T

The Upper Muksu River Basin, located in the mountainous region of Tajikistan, is significantly influenced by the dynamics of snow cover and glaciers, which are essential contributors to the hydrological regime. The study of snow and glacier dynamics in this region is critical for understanding seasonal hydrological changes, water availability, and future climate impacts. This study aims to investigate the snow cover and glacier dynamics in the Upper Muksu River Basin (25587km2) using remote sensing techniques and hydrological modelling. Remote sensing data from Modis and Sentinel-1 satellites are utilized to monitor snow cover variations and glacier Dynamics, while ArcMap, SNAP and Python are used for spatial analysis, data processing, and modelling tasks. This study shows that Upper Muksu River Basin snow cover where is from 100 percent coverage to minimum of 25 to 30% in peak summer. The study using time series of SAR data highlights the variation in Glacier radar zones its impact on ELA variations. Hydrological modelling is performed to simulate the runoff generated from snowmelt and glacier meltwater using SPHY model. This research will contribute to better understanding the glacial and snow processes in the basin, supporting water resource management and climate adaptation strategies for the region.

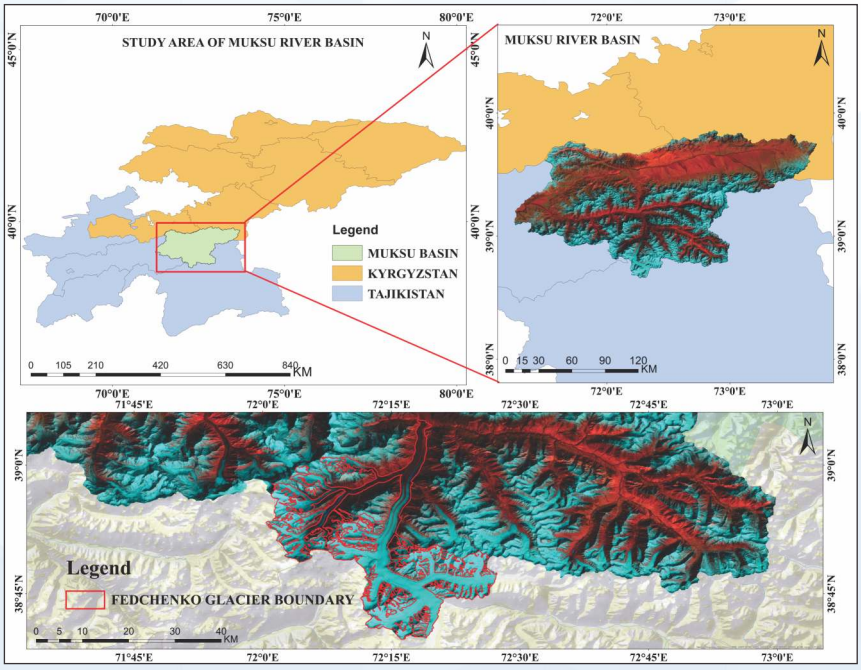


Fig. 1: Study area of upper Muksu River Basin

Keywords: Snow Cover, Snowmelt, Remote Sensing, Sentinel-1, Python

Analysis of the relationship between corn cultivation, burnt area, and AOD in Chiang Mai, Thailand

Mr. Thitipong Boontan
Geospatial Officer, Highland Research
and Development Institute
Email: Thitipong.boontan@gmail.com

Supervisor
Dr. Dipanwita Haldar, Scientist/Engineer – SF
Agriculture and Soils Department, IIRS, Dehradun-248001

Co-Supervisor
Dr. Kamal Pandey, Scientist/Engineer - SE & Web Information Manager
Geo-web Services, IT and Distance Learning Department,
IIRS, Dehradun-248001

Air pollution is a major issue in northern Thailand, especially in Chiang Mai, where annual haze events severely impact health and the environment. A key contributor is open burning in agricultural areas, driven by large-scale corn cultivation. Farmers often burn crop residues to clear fields, releasing significant amounts of air pollutants. Chiang Mai's topography further traps these pollutants, worsening haze conditions. This study examines the relationship between corn cultivation, burnt areas, and Aerosol Optical Depth (AOD) using satellite data to better understand the impact of agricultural burning on air quality. Using data from Sentinel for creating a model to be used for automatic processing in the future.

This study classified maize cultivation areas using Sentinel-1 data and Support Vector Machine (SVM) during the May–December 2023 growing season, achieving 96.41% accuracy. Burned area detection was conducted within these maize fields using Sentinel-2 data from January to May 2024, before the next planting season. Burned areas were identified using the Normalized Burn Ratio (NBR), with unwanted features filtered out using SCL removing clouds (class 9) and cloud shadows (class 3). SAVI Filtering out dense forest (>0.3) and MNDWI excluding water and muddy soil (0-0.2). The Differenced Normalized Burn Ratio (dNBR) was then calculated to quantify burned areas, validated against Suomi VIIRS C2 hotspots, yielding 84.07% accuracy. Additionally, the correlation between burned areas and air pollution was analyzed using Sentinel-5P Aerosol Index (AI) to track atmospheric aerosols, such as smoke and haze, during the burning period.

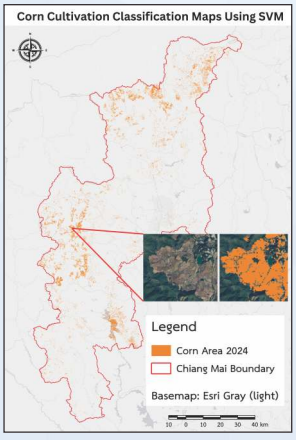


Fig. 1: Corn Cultivation Map 2023

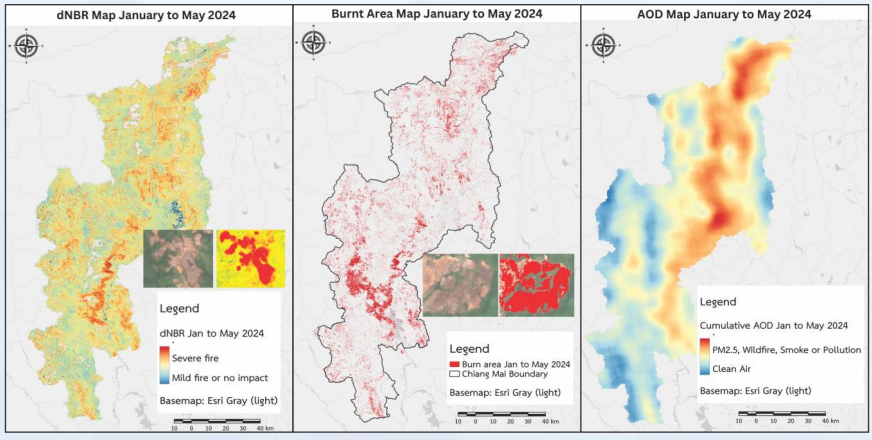


Fig. 2: Burnt Area (dNBR) and Aerosol Optical Depth (AOD) Maps 2024

Keywords: Corn Cultivation, Burnt Area, AOD, SVM, dNBR, GEE, Sentinel 1, 2, 5P

Machine learning-based analysis of Land use changes in Tashkent, Uzbekistan

Shakhzoda Abdurakhmanova Sobirovna
Ministry of ecology, environmental protection and climate change of the Republic of Uzbekistan.
Digitization Specialist in the "Climate Data Preservation in Uzbekistan (Phase 2)" Project, Agency of the hydrometeorological service
Email: shaxzoda03051998@gmail.com

Supervisor
Mr Ashutosh Kumar Jha, Scientist/Engineer – 'SF'
Geoinformatics Department, IIRS, Dehradun.
Email: akjha@iirs.gov.in

A B S T R A C T

This study applies machine learning (ML) techniques to analyze land use changes in Tashkent, Uzbekistan, focusing on the effects of rapid urbanization. Using satellite images from Landsat-8 and Landsat-9, combined with Geographic Information System (GIS) data processed through Google Earth Engine (GEE) and QGIS, the study examines land use categories such as residential, commercial, industrial, agricultural, and green spaces. The primary goal is to detect and predict how these categories have evolved over time and understand the spatial dynamics of these changes.

Machine learning algorithms like Random Forest (RF), Support Vector Machines (SVM), and Neural Networks (NN) are used to classify and predict land use types. These models are trained on historical data to identify trends like urban sprawl, agricultural conversion, and the loss of green spaces. The models also predict future land use changes, providing insights for urban planning.

Land use classification is done using platforms like ArcGIS, ERDAS IMAGINE, and QGIS, which help analyze satellite imagery efficiently. Google Earth Engine (GEE) processes large volumes of satellite data quickly and cost-effectively, aiding in model development.

The study also integrates NetLogo for simulating and visualizing future land use scenarios. Combining machine learning predictions with agent-based modelling allows the study to explore potential future changes in Tashkent's land use. The results show significant transformations, including urban growth, agricultural land conversion, and green space reduction. The models demonstrate high accuracy in classifying land use and predicting future changes, highlighting the usefulness of ML in urban planning and sustainable land management.

This study emphasizes the importance of remote sensing, machine learning, and simulation in urban studies, providing a scalable and cost-effective approach to monitoring land use changes.

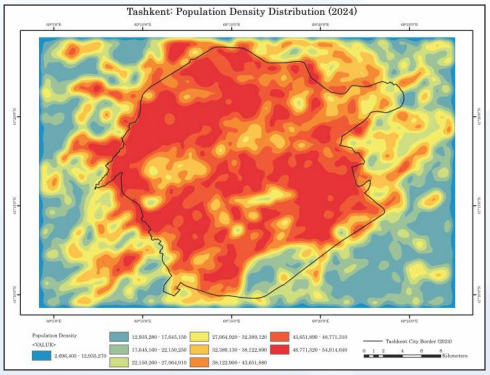


Fig. 1: Tashkent: Population Density Distribution (2024)

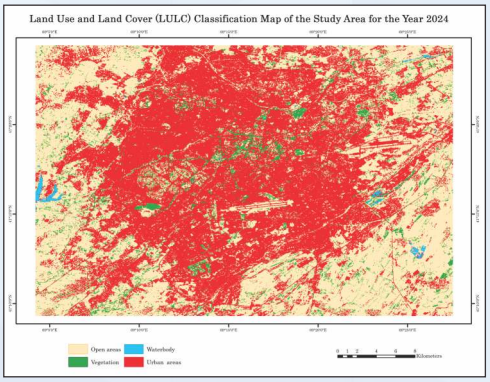


Fig. 2: Land use and Land cover (LULC) Classification Map of the Study Area for the year 2024

Keywords: Machine Learning, Random Forest, Support Vector Machines, Neural Networks, NetLogo

Study of Air Pollution over Uzbekistan using Model Data Reanalysis

Mr.Muzaffarjon Murodov
Quality control specialist at Hydrometeorological Service Agency under the Ministry of Ecology and Environmental Protection and Climate Change of the Republic of Uzbekistan
Email: muzaffarjonm@mail.ru

Supervisor
Dr. Manu Mehta- Scientist/Engineer 'SF'
Photogrammetry and Remote Sensing Department
Indian Institute of Remote Sensing, ISRO, Govt. of India
4, Kalidas Road, Dehradun- 248001, India.

For this project, I have selected the topic "Study of Air Pollution over Uzbekistan using Model Reanalysis," which addresses a critical environmental issue affecting millions of people in my country. Air pollution is the presence of harmful substances in the atmosphere, which can originate from natural and human-made sources. The pollutants in the air can impact the climatic conditions as well as human health. The primary aim of this study is to examine the long term variability of major air pollutants in Uzbekistan. The MERRA-2 Reanalysis platform (NASA) will be used to gather the necessary data, which provides comprehensive datasets on atmospheric conditions and pollutants. The focus of this study will be on key pollutants such as Dust (PM10, PM2.5), Sulfate Aerosols (SO4), Black Carbon, and Organic Carbon, which significantly affect air quality. Data covering the years 2014 to 2024 will be analysed to investigate long-term air pollution trends during the winter season. Through this study, a clearer understanding of the pollution levels in Uzbekistan will be gained, providing valuable insights that can contribute to improving the environment and offering useful information to develop preventive measures for air pollution.

Keywords: Air Pollution, Dust, Black Carbon, Organic Carbon, Sulfate Aerosols (SO4)

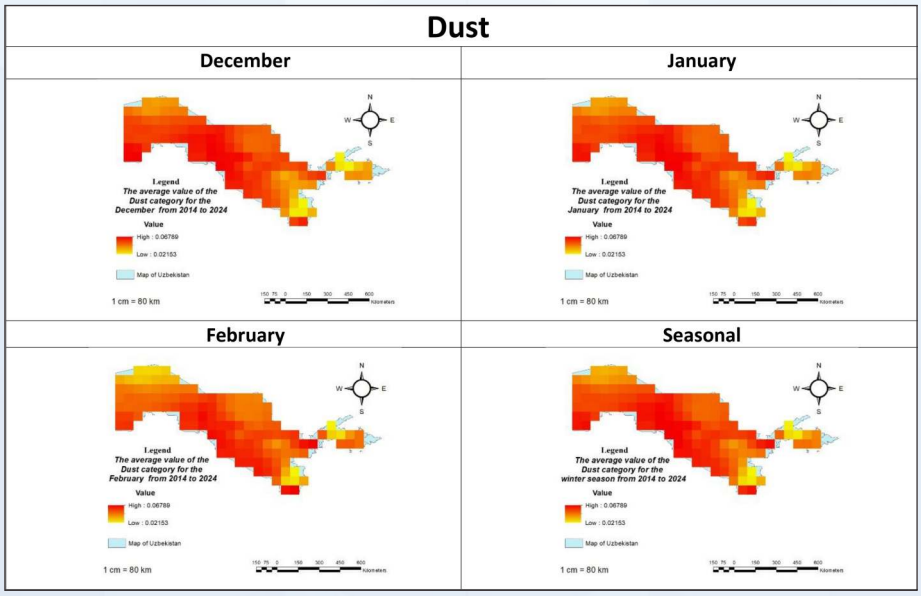


Fig. 1: The average value of the Dust category for winter session from 2014 to 2024

Photo Gallery

Participants interacting at CCSTEAP International Hostel

Clockwise from Top

1 - Wall Painting Competition
2 - Independence day Cultural Events
3 - Rafting at Rishikesh
4 - Birthday Celebrations
5 - At Taj Mahal, Agra

Clockwise from Top

6 – In front of IIRS Main Building
7- Visit to FRI, Dehradun
8 - Garba Cultural Event
9 - Field visit to Asan Barrage

Clockwise from Top

10 - At IIRS Campus
11 - Playing Billiards
12 - Playing football match
13 - At Hostel
14 - Playing Chess
15 - Playing Holi

Impressions of Participants

In Remembrance

Beyond Borders: A Journey of Friendship and Learning

Strangers to one another, twenty participants from ten different countries came to a picturesque city in India called Dehradun in June 2024. United by the shared passion for learning, we embarked on an unforgettable journey, joining the prestigious 28th PG Diploma Course in Remote Sensing (RS) and Geographic Information Systems (GIS), organized by CSSTEAP. It was a moment of excitement, anticipation and the beginning of a transformative experience for all of us. This program was designed to empower scholars from the Asia-Pacific region to promote social and economic progress through the effective application of spatial data and geospatial technologies.

The first week started off with the administrative procedures of getting our SIM cards and Bank accounts being made operational along with getting comfortable into our new home called “Yamuna Hostel”. Our academic journey began with essential Remote Sensing concepts, rolling to the mastery of advanced geospatial techniques and tools like ArcGIS, QGIS, Google Earth Engine, SNAP, ENVI, Python, and GIS databases. As days progressed, we immersed ourselves in an intensive curriculum, delving into subjects such as Advances in Image Analysis & Geoinformatics, Agricultural & Soil Resource Management, Forest Resource & Ecosystem Analysis, Natural Hazards and Disaster Risk Management, Geological Remote Sensing, and Satellite Hydrology & Water Resource Management.

Under the guidance of leading scientists and researchers, we gained valuable insights from their published works and practical applications, strengthening our grasp of fundamental concepts. Engaging in the TRISHNA workshop and tutorials at Ahmedabad enriched us with valuable knowledge and skills.

It wasn't just about academics, we got a chance to engross ourselves in most of the cultural activities held at IIRS, showcasing our talent through scintillating dance performances to the tunes of Jai Ho and Bharat ki Beti. Our resilience stood out as we passionately competed in annual sports events like Football, Volleyball, Badminton, Chess, Carrom, Tug of War and Table Tennis. As a testament to our perseverance and team spirit, we emerged champions in Football, Table Tennis and Carrom. We were privileged to explore sites of historical and cultural significance across India, which greatly deepened our experience. From the tranquil vistas of Mussoorie and Landour to the spiritual sanctuaries of Haridwar and Rishikesh, and the iconic

monuments of Agra, Delhi, Ahmedabad and Vadodara, our journey was a rich tapestry of cultural exchange and mutual celebration. Visits to distinguished scientific landmarks, including the Statue of Unity and Science City, enriched our appreciation of India's technological advancements.

The country presentations given by our classmates from different countries helped us understand about their country's heritage. The scrumptious cuisines prepared by them took us on a virtual journey to the street food of their homelands. Late-night study sessions, birthday celebrations and cultural festivities created lasting bonds among us.

As we approach our goodbyes, our hearts are filled with nostalgia and we leave with a wealth of knowledge and cherished memories, ready to apply our learnings back home.

In these nine short months, we have come a long way, from getting accustomed to the spicy Indian food to loving the flavours of Indian cuisines, from walking together in the bustling streets of Paltan Bazar to running marathons together in the calm hills of Mussoorie, from being strangers to one another to being the best of friends. It was an immensely enriching experience, where the fusion of academic insight and invaluable life lessons formed memories that will last a lifetime. We have not only gained academic knowledge but also made lifelong friends across borders.

We express our heartfelt gratitude to CSSTEAP, IIRS-ISRO, and the supporting departments and agencies for their steadfast guidance and support, which made this incredible journey of growth and enlightenment possible.

On behalf of 28th RS&GIS batch, I extend profound thanks. Jai Hind!

BON VOYAGE!!!

Wg Cdr Raj Kumar Maurya
Indian Air Force

"Sometimes, Along the Way Matters More Than the Destination"

As the end approaches, we often look back to where it all began, reflecting on everything we've been through. It wasn't easy for me to embark on this journey alone, not knowing what lay ahead unfamiliar places, new environments, different people, and cultures I had never experienced before. But I still made the decision to take this journey to participate in the 28th PG Diploma Course in Remote Sensing and Geographic Information Systems at IIRS, Dehradun, India.

My name is Thitipong Boontan, and I am the only participant here from Thailand. I have always loved traveling in my home country, but this time, it was different. This was the longest and farthest journey I had ever taken nine months away from home. Despite that, I knew I would enjoy every moment of it.

I have always been passionate about exercising, especially running. To me, running is more than just a physical activity; it is a means of exploration and self-discovery. It is not just about putting on running shoes and heading out it is about meeting new people, discovering new places, and allowing my body to recover from a long day of work. Running exposes me to sunlight, the sounds of nature, and mental rejuvenation. This is what running means to me, and it is why I fell in love with it.

Here, in Dehradun, I had the opportunity to participate in my first race-the "Navy Half Marathon." I was excited, and so were my classmates. We encouraged each other to register, train together, and discuss race preparations. Some of us ran shorter distances, while others took on longer challenges. Some were racing for the first time in their lives, while others had lost count of their previous races. But one thing was certain no two runs are ever the same. Each race brings new excitement, and this one was no exception.

When race day arrived, we ran together. We all became finishers. There was joy, laughter, and a sense of achievement as we crossed the finish line. Everything that followed became a cherished memory one that will stay with us forever. Whenever we think back to that day, we will smile, proud of ourselves for having shared this journey. We trained together, struggled together, and overcame every challenge side by side. Every single person did an incredible job.

As someone who has been running for years, I was proud to see my friends embrace running, with some even making it a part of their daily routine. After our first race, we continued to join other events, such as the "Doon Half Marathon," a challenging uphill race that made us want to cry, the "RG Hospital Marathon," where we ran alongside 16,000 participants a truly unforgettable experience, And “the Dehradun Ultra Marathon,” with a long-distance race of up to 75km.

Regardless of the reasons that bring people to running, I believe that running always leads us to something good. It was running that gave me the courage to take on this journey one that introduced me to new friends, new places, new cultures, and new experiences. I am grateful to myself every single day for making the decision to be part of this program. I have been incredibly happy here, surrounded by kind-hearted people who have made this journey even more special.


I would like to express my sincere gratitude to my friends for helping me create such beautiful memories, as well as to the Course Director, Course Coordinator, and faculty members for taking such good care of us. Now, I have successfully completed my final challenge the Dehradun Ultra Marathon, a 50km race, in just over six hours, running along the beautiful trails of Dehradun. The people here have always been incredibly welcoming and kind to me, making this an unforgettable memory of my time here. It was truly perfect, and I am so proud of myself for accomplishing this feat. For me, running remains simple, beautiful, and truly wonderful.



Finally, I would like to express my appreciation, joy, and pride for our classmate, Perliimaa from Mongolia. Before coming here, the farthest she had ever run was just 5 kilometers in a running competition in her home country. However, she dedicated her free time after class to training, practicing, and running every evening, believing that this could become her new hobby. Today, she has achieved an incredible milestone winning three awards in running competitions here, including the 10km (Doon Half Marathon) and 25km (Dehradun Ultra Marathon) races. I hope this experience becomes a cherished memory for her as well. Once again, thank you for creating such wonderful memories for all of us.

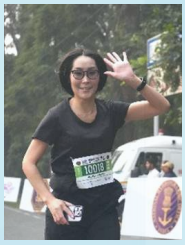

To everyone reading this, I want to say.

"Believe in yourself. Do not let fear hold you back. Be brave enough to embark on new journeys and experience the beauty of this world."

I wish you all happiness, good health, and a fulfilling life.

Thitipong Boontan
Participant from Thailand

IF YOU FIND ME ON THE GROUND, PLEASE DRAG TO FINISH LINE!



"This article is dedicated to my friend, Thitipong"

I started hiking when I was a high school student. Usually I go hiking on some weekends in Mongolia, but I never thought about running before coming India. Last October, I heard the guys in my class talking about a marathon being held soon. It was interesting to me, so I decided to run in the marathon and asked for help from my Thai friend, Thitipong, who had experience in running. Firstly, I thought I would only run 5 km, however he offered me 10 km after the first training. It sounded daunting to me, but he made a month training plan for me and we started training together. In the first 14 days of training, I felt discouraged, and after running, I was experiencing severe body aches and symptoms of fatigue. I wanted to give up, but I continued training for the next 14 days, and finally the day of the marathon I had been waiting for arrived. In the Navy marathon, I felt like I had defeated myself crossing finish line on the 10th November 2024. After all that happened, running 10 km no longer seemed difficult to me, and my body also started to get used to running.

Fig. 1. In the Navy Marathon

In my second 10k run, Thitipong was my pacer in the Doon Marathon, held on 2nd February 2025. After covering half the distance (5 km), we realized I was running in 4th place among the woman runners. So, I tried my best and catch up a woman. Although that woman tried to catch up me during next 3 km, I wasn't given a chance to slow down and it was not only 10 km run-it was a test of endurance, patience and pacing hilly, winding course. The frequent curves added up hill making it even more challenging. In the Doon Marathon, we took 3rd place in overall female and 1st place in age category. I didn't do it alone, we did!

Fig. 2. In the Doon Marathon and RG Marathon 7.0

In my third 10k run, our classmates participated the biggest marathon, 16000 participants, named after RG Hospital in Dehradun on the 23th February and we updated our own personal records. After 5 months of starting to run, every run has become one of the most exciting things for me.

The next crazy goal I set for myself is 25 km in Dehradun Ultra Marathon on the 9th March 2025. Still I can't believe myself, but I really want to keep running and feel these amazing feelings in my whole life! I would like to express my special gratitude to my Thai friend Thitipong who has been a special impact to discover new hobby.

Ms. Perliimaa Gantumur
Mongolia

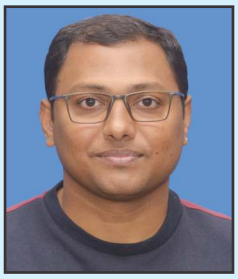
CSSTEAP – RS & GIS COORDINATION TEAM

Mr. C.M. Bhatt
Course Director

Dr. Arijit Roy
Programme Coordinator

Dr. Sanjeev Kumar Singh
Course Coordinator

COURSE OFFICERS & ADMINISTRATIVE SUPPORT



Mr. Justin George K
Agriculture and Soil Department

Mr. Ashutosh Kumar Jha
Geoinformatics Department

Mr. Yateesh Ketholia
Disaster Management Studies Department

Dr. Taibanganba Watham
Forestry and Ecology Department

Dr. Shashi Kumar
Photogrammetry and Remote Sensing Department

Dr. Sachiko Mohanty
Marine Sciences Department

Dr. Arpit Chouksey
Water Resource Department

Dr. Suresh Kannujiya
Geosciences Department

Dr. Asfa Siddiqui
Urban & Regional Studies

Mr. Ravi Bhandari
Geoweb Services,
IT and Distance Learning

Mr. Kamal Pandey
CSSTEAP
Hostel Warden

Mrs. Meena Jethi
Students Affairs Officer
CSSTEAP Secretariat


Malaysia
Mongolia
Myanmar
Nauru
Nepal
Bangladesh
Armenia

DOON

HALF MARATHON 2025

START/FINISH

CSSTEAP (Affiliated to UN)

IIRS Campus, 4 Kalidas Road, Dehradun, India

Tel.: +91 135 2740737, 2740787, Fax : +91 135 2740785

E-mail : cssteap@iirs.gov.in, Website : www.cssteapun.org