



Center for Space Science and Geomatics Studies (CSSGS)

Capacity Building opportunities: Space and Geospatial Education in Nepal

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Outline of the Presentation

- Background
- Goals
- Research Activities
- Establishment of GNSS Lab
- Future plan



Background

- Pashchimanchal Campus, Tribhuvan University established Bachelor Degree in Geomatics Engineering in 2013 and Master of Science in Geospatial Engineering in 2020 to meet the demands of Geospatial engineering human resources in Nepal
- Center for Space Science and Geomatics Studies established in 2018



- Initiated the research activities to support for the Master in Geospatial Engineering
- The center is devoted to space science research and Geomatics education.
- Establishment of GNSS Lab for capacity building in the field of Global Navigation Satellite Systems (GNSS) .



Background

- This center response in terms of specific needs of country and society's economics, and the environment in the field of
 - Land monitoring,
 - Disaster research
 - Tourism Planning
 - Agriculture planning,
 - Pollution studies and
 - GNSS Applications



VISION

- To become a center of excellence in the field of GNSS in Nepal.
- To become leading institute for research and training in Space Science and Geomatics studies.



Center for Space Science and Geomatics Studies (CSSGS)

- RESEARCH ACTIVITIES FOR CAPACITY BUILDING



Statistics of UTOKYO/ICG GNSS Training Program hosted by CSSGS Pashchimanchal Campus, Tribhuvan University, Pokhara , Nepal- 2022

Training Mode / Location	Hybrid-Training Venue: Nepal	
Date and Duration	11 – 14 Jan 2022 3 days	28 Jan 2022 1 day
Course Type	Course A	Course B
(A) ICG Funded International (travel only)	(5 awarded but Cancelled due to Corona Situation, attended online)	NA
(B) Other Funding (travel only)	NA	NA
(C) Self Funded International	(3 but cancelled due to Corona Situation, attended online)	NA
(D) Self-Funded Domestic (Thailand or Nepal)	30 (On-site Nepal)	NA
(E) Online Participants	45	25
Total (A + B + C + D + E)	75	25
Number of Applicants	90	40
Number of Resource Persons	13	3
Number of Countries	16	10
Resource Persons' Countries	7	2

पश्चिमाञ्चल क्याम्पसमा वैज्ञानिक कार्यशाला

आदर्श समाज

पोखरा, ३ माघ

पश्चिमाञ्चल क्याम्पस पोखरामा मंगलबारबाट सुरु भएको ग्लोबल नेभिगेसन स्याटलाइट सिस्टम विषयको ४ दिने वैज्ञानिक कार्यशाला तथा तालिम राष्ट्रिय र अन्तराष्ट्रियस्तरका वैज्ञानिकहरूको कार्यपत्र प्रस्तुतिका साथ सम्पन्न भएको छ।

समापन समारोहमा गण्डकी प्रदेश शिक्षा संस्कृति, विज्ञान प्रविधि तथा सामाजिक विकास मन्त्रालयका सचिव विनोदबहादुर कुँवरले शैक्षिक संस्थाहरूसँग सहकार्य गरेर दिगो प्रविधि र अनुसन्धानमूलक क्रियाकलाप अघि बढाउन सकिने धारणा व्यक्त गर्दै राष्ट्रिय प्राथमिकताका आधारमा अनुसन्धानात्मक क्रियाकलापहरू अगाडि बढाउनु पर्ने आवश्यकता औल्याए।

कार्यक्रममा नेपाल सरकारका पूर्व सचिव बाबुराम आचार्यले अनुसन्धान विना राष्ट्रिय विकासका लक्ष्य पहिल्याउन नसकिने भएकोले शैक्षिक संस्था एवं अनुसन्धान कर्ताहरूलाई सेवा, सुविधा र तालिमहरू मार्फत प्रोत्साहन गरिनु



पर्ने र शिक्षालाई जीवन उपयोगी बनाउनु पर्ने बताए।

अन्तरिक्ष विज्ञान तथा जियोम्याटिक्स अध्ययन केन्द्रका निर्देशक सह प्राडा कृष्णप्रसाद भण्डारीले केन्द्र मार्फत विभिन्न आयोजनाहरूमा काम गर्ने अवसर प्रदान गरी विद्यार्थीहरूको ज्ञान र सीपलाई अनुसन्धानमूलक क्रियाकलापहरू मार्फत अगाडि बढाउने बताउँदै आगामी वर्ष पोखरा जिएनएसएस वैज्ञानिक कार्यशाला तालिम सम्पन्न गरिने जानकारी दिएका थिए।

विश्वविद्यालय अनुदान आयोगको आर्थिक सहयोग र अन्तरिक्ष विज्ञान तथा जियोम्याटिक्स अध्ययन केन्द्र, इन्जिनियरिङ

अध्ययन संस्थान, पश्चिमाञ्चल क्याम्पस पोखराको संयोजन तथा भौगोलिक सूचना विज्ञान अध्ययन केन्द्र टोकियो विश्वविद्यालय जापान एवं युनाइटेड नेसन अर्न्तगत ग्लोबल नेभिगेसन स्याटलाइट सिस्टम सम्बन्धी अन्तराष्ट्रिय समितिको सह-संयोजनमा उक्त वैज्ञानिक कार्यशाला गोष्ठी तथा तालिम कार्यक्रम सम्पन्न भएको हो।

क्याम्पस प्रमुख निर्मलप्रसाद बरालले बहुआयामिक शिक्षा र आयोजनाहरूको दिगो विकास एवं भौतिक सुधारका विभिन्न पक्षमाथि प्रकाश पार्दै जिएनएसएस प्रविधि र उपकरणहरूको प्रयोगद्वारा व्यावहारिक अनुसन्धानलाई अगाडि बढाउन सकिने विचार व्यक्त गरेका

थिए। तालिममा सहभागीको तर्फबाट केशवराज भुसालले तालिम कार्यक्रम अध्ययन अनुसन्धान क्रियाकलापहरूलाई अगाडि बढाउन अत्यन्त फलदायी भएको विचार व्यक्त गरे।

भर्चुअल कार्यक्रमका सहजकर्ता टोकियो विश्वविद्यालयका प्राडा दिनेश मानन्धर, युनाइटेड नेसन अर्न्तगतका अन्तराष्ट्रिय समितिका सदस्य सराफात व्याडोने एवं अन्तरिक्ष विज्ञान तथा जियोम्याटिक्स अध्ययन केन्द्रका निर्देशक सह प्राडा कृष्णप्रसाद भण्डारीले सहआयोजक संस्था तथा सहयोगी संस्था विश्वविद्यालय अनुदान आयोग नेपालप्रति धन्यवाद व्यक्त गरेका थिए।



Center for Space Science and Geomatics Studies (CSSGS)





Statistics of UTOKYO/ICG GNSS Training Program hosted by CSSGS Pashchimanchal Campus, Tribhuvan University, Pokhara , Nepal- 2023

Training Mode and Location	Training –Hybrid Venue –Pashchimanchal Campus, Pokhara, Nepal	
Date and duration	3-6, January ,2023	9 January,2023
Course type	Course A	Course B
(A) Self funded international	Total 3 participants one from Sri Lanka and 2 from India	NA
(B) Self funded domestic	(50 participants) onsite from Nepal	NA
(C)Online Participants	200 participants	20
Total (A+B+C)	255	20
No of Applicants	300	30
Number of Resource Persons	6	2
Number of Countries	16	6

इन्जिनियर कलेजमा वैज्ञानिक कार्यशाला

निलब लामिछाने
पोखरा, २८ पुस



अन्तरिक्ष विज्ञान तथा जियोम्याटिक्स अध्ययन केन्द्र इन्जिनियरिङ अध्ययन संस्थान, पश्चिमाञ्चल क्याम्पस, पोखराको संयोजन तथा भौगोलिक सूचना विज्ञान अध्ययन केन्द्र टोकियो विश्व विद्यालय, जापान एवं युनाइटेड नेशन्स अन्तर्गत ग्लोबल नेभिगेसन स्याटलाइट सिस्टम सम्बन्धी अन्तर्राष्ट्रिय सर्भिको सह-संयोजनमा पोखरामा ग्लोबल नेभिगेसन स्याटलाइट सिस्टम विषयको ४ दिने वैज्ञानिक कार्यशाला तथा तालिम मंगलबार सुरु भएको छ।

गण्डकी प्रदेश नीति तथा योजना आयोगका उपरक्षक डा. रघुराज काफ्लेले कार्यक्रम उद्घाटन गरे। काफ्लेले नेपालको कृषि, यातायात, प्रविधि, पर्यटनका क्षेत्रमा महत्वपूर्ण योगदान पुर्याउन सक्ने कार्यक्रमहरूको कार्यान्वयन र वैज्ञानिक क्षमता अभिवृद्धिका लागि राज्य स्तरबाट लगानी बढाई प्रोत्साहन गरिने प्रतिबद्धता व्यक्त गरे।

ग्लोबल नेभिगेसन स्याटलाइट सिस्टम अन्तर्राष्ट्रिय सर्भिको सदस्य सराफात ग्याङ्गोनी र टोकियो विश्व विद्यालय का प्राडा दिनेस मानन्धरले आ-आफू ना कार्यचक्र मार्फत अन्तरिक्ष सूचना पढाउने र जियोम्याटिक्स अध्ययन अनुसन्धानको माध्यमबाट विशिष्टीकृत कृषि प्रणाली, मत्स्य

संरक्षण, दैवी प्रकोप नियन्त्रण तथा पूर्व सूचना एसएमएस पढाउने, दूरसञ्चार आदि क्षेत्रमा पुन्याउन सकिने योगदानहरूको बारेमा प्रकाश पारेका थिए।

भर्चुअल माध्यमबाट अन्तर्राष्ट्रिय स्तरका वैज्ञानिकहरू पिनका वैज्ञानिक जिओपुन लु, भारतका वैज्ञानिक अखिलेश्वर रेड्डी, अमेरिकाका वैज्ञानिक जेफ और ज्याक तथा युरोपियन कमिसनका वैज्ञानिक डोमिनिक क्रेजले ग्लोबल नेभिगेसन स्याटलाइट सिस्टम अन्तर्गत आ-आफूना देशले सञ्चालन गर्दै आएका पढाउने विडियो, नेभिग, जिपिएस तथा ग्यालेलियोको बारेमा प्रकाश पार्दै ती पढाउनेहरूले विभिन्न क्षेत्रमा पुन्याएको योगदानहरूको बारेमा चर्चा गरेका थिए।

क्याम्पस प्रमुख निर्मलप्रसाद बरालले राज्य, विश्वविद्यालय र औद्योगिक क्षेत्रबीचको सहकार्यबाट अनुसन्धानमूलक कार्यहरू राष्ट्रिय प्रार्थिकताको आधारमा सम्पन्न गर्न सकिने बताए। पश्चिमाञ्चल क्याम्पसका सह-प्राडा कृष्णराज अधिकारीले अनुसन्धानमूलक कार्यक्रमहरूलाई अगाडि बढाउँदै लैजानुपर्ने आवश्यकता औल्याए।

उक्त वैज्ञानिक सम्मेलन तथा तालिम कार्यक्रमका संयोजक एवं अन्तरिक्ष विज्ञान तथा जियोम्याटिक्स अध्ययन केन्द्रका निदेशक सह प्राडा कृष्णप्रसाद भण्डारीले नेपालको सर्वोत्तमको विकासका लागि स्याटलाइट सिस्टम र जियोम्याटिक्स अध्ययन अनुसन्धानको महत्वमयि प्रकाश पार्दै अध्ययन केन्द्रले कृषि, पर्यटन र पूर्वाधार विकास एवं पश्चिमाञ्चल क्याम्पसमा सञ्चालन गर्दै आएको शैक्षिक क्रियाकलापहरूको बारेमा बताएका थिए। पश्चिमाञ्चल क्याम्पस जियोम्याटिक्स इन्जिनियरिङ विषयका विद्याधीय दीपेश लामिछाने र आस्मा देवकोटाले सञ्चालन गरेको उक्त कार्यक्रममा स्नातकोत्तर तहमा अध्ययनरत विशाधीहर, प्राध्यापकहरू, नागो कार्यालय पोखराका अधिकृतहरू लगायतको सहभागिता छ।



Center for Space Science and Geomatics Studies (CSSGS)





- **Training on DGPS and Terrestrial LiDAR Scanner supported by UGC, Nepal**
- Training was held from 12-16 Asar, 2079.
- Training was focused for faculty, Master level students and fourth year students of Bachelor of Geomatics Engineering
- 90 participants
- 5 days training and it was conducted in two groups



Center for Space Science and Geomatics Studies (CSSGS)

LIDAR Training Activities (UGC Fund)





Center for Space Science and Geomatics Studies (CSSGS)

MOU and Collaboration with National and International Organization

1. Canada Nepal Geomatics Advancement Foundation (CNGAF)
2. Center for Spatial Information Science ,
The University of Tokyo
3. Annapurna Rural Municipality , Kaski
4. South Queensland University , Australia
(Informal cooperation process for MOU)
5. Phranakhon Si Ayutthaya Rajabhat University, Thailand (Process)



Membership in international organization

- CSSGS is associate member in Asian Association of Remote Sensing

[Associate Members | AARS \(a-a-r-s.org\)](#)

- Adviser in International Society for Photogrammetry and Remote sensing (ISPRS) working Group IV/V
- [ICWG V/IV \(isprs.org\)](#)
- Stakeholders partner in Space 4 water in UNOOSA



Center for Space Science and Geomatics Studies (CSSGS)

Research Activities with Provincial Government in Nepal

- Precision Agriculture for Small Scale Farming Project collaboration with Lamjung Agriculture Campus

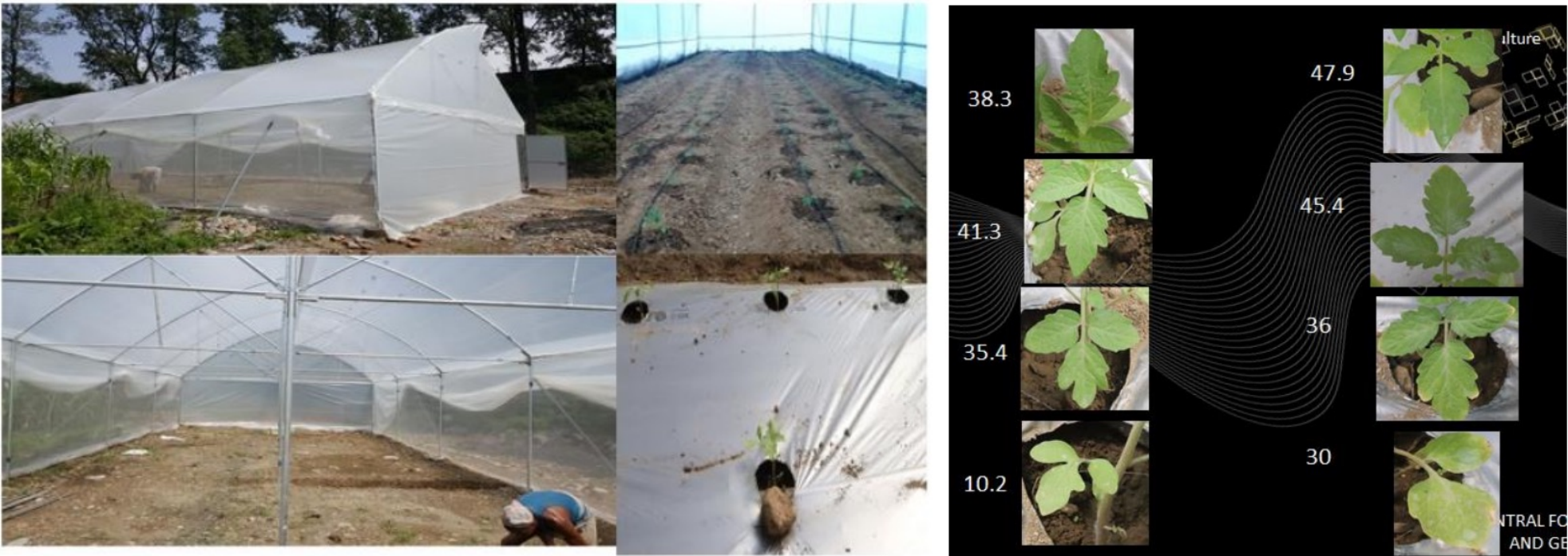


Figure 4-25 Field measurement of the tomato leaf in WRC.



Center for Space Science and Geomatics Studies (CSSGS)

Research Activities with Provincial Government in Nepal

- Policy Level talk programs for establishment of CORS in Gandaki Province, Nepal
- Formation of task committee for Natural Disaster Reduction and Management based on GNSS Technology in Gandaki Province ,Nepal
- Workshop on GNSS for Policy and Decision Makers in 2022 and 2023



Center for Space Science and Geomatics Studies (CSSGS)

Collaboration with Center for Spatial Information Science (CSIS)

The University of Tokyo

- Conduction of Pilot Projects in the fields of GNSS applications
 - Low-Cost High-Accuracy Position Assessment using MADOCA-PPP
 - Traffic congestion analysis
 - Dynamic Air Quality Monitoring using Low-Cost GNSS receiver systems
 - Rapid Prototype Development (RPD) Challenge



Master Thesis on GNSS Applications

- **Master students have selected GNSS as a part of their Master Thesis.**
 - Air Quality Monitoring Using Low-Cost GNSS Receivers and Air Quality Sensors in Urban Environment.
 - Analysis of Perceptible water vapor using Global Navigation Satellite System Observation
 - Total Electron Content Estimation and Comparison Using Multi-GNSS Constellations



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Rapid Prototype Development (RPD) Challenge

- It was conducted by CSIS, UTOKYO of Japan and Thailand
- Participated in 2022 , two groups of students (8 persons) and instrument were supported by sonny and CSIS
- Participated in 2023 , two groups of students(8 persons) and instrument were supported by sonny and CSIS
- They model the prototype of flood and forest fire early warning system
- The judge of 2023 year groups has recommend for writing the project for research for funding



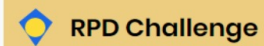
Center for Space Science and Geomatics Studies (CSSGS)

Forest Fire Early Warning System

Friday
March 17, 2023

Prototype On Forest Fire Early Warning System

Presentation by
Team Extinguisher



Team Introduction



Saugat Paudel
Bachelor In Geomatics Engineering(3rd Year)
IOE Pashchimanchal Campus

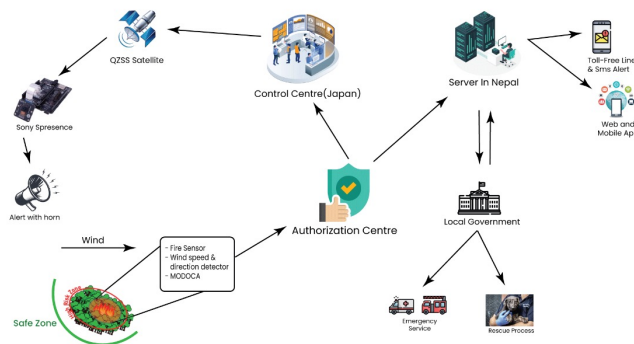


Ramesh Pariyar
Bachelor In Geomatics Engineering(3rd Year)
IOE Pashchimanchal Campus



Aayush Chand
Bachelor In Geomatics Engineering(2nd Year)
IOE Pashchimanchal Campus

Project Process



Realtime Working



- o **Fire Alarm:** Audio & Video signalization to warn people about a possible fire occurrence in the certain area of coverage.
- o **Webapp:** Area & direction of fire, danger level, windspeed, rescue-team status, safezone & forest fire related data can be determined.



- o **Mobile app:** Every service of the webapp is available. Other services like user's location, fire brigade & rescue team tracking, safer place navigation etc can be done.
- o **Toll-free line, SMS service:** Used for getting updates as well as customer support for people enquiries, local updates, and rescue support. This service will be useful during internet issues due to disaster.



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Flood Early Warning System

Team :GEOCODERS-FLASH



Bhoj Raj Bist

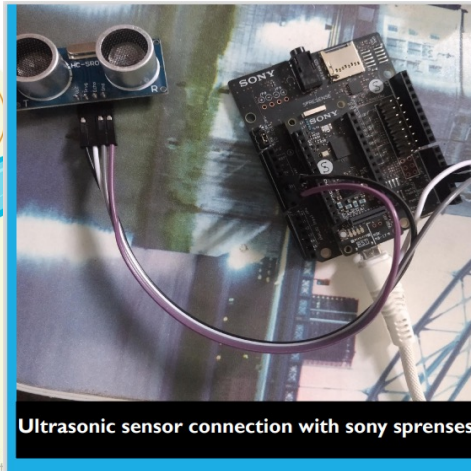
Hem Raj Pandey

Hemant Mahatara

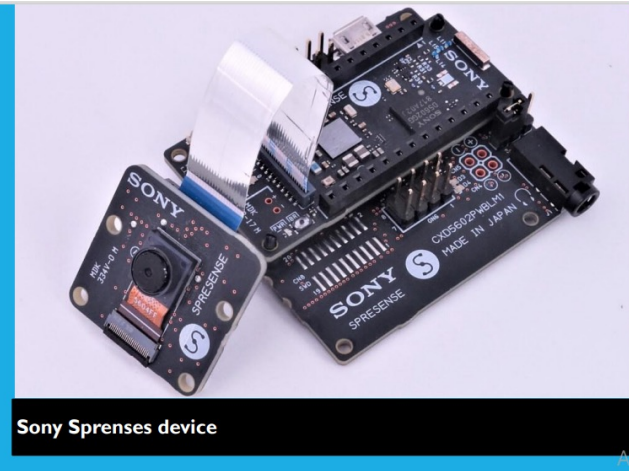
Hem Raj Pandey

PROPOSED SYSTEM

Undergraduate Geomatics Engineering Student at IOE, Pashchimanchal Campus



Ultrasonic sensor connection with sony spresenses



Sony Spresenses device



Pilot Projects: Dynamic Air-Quality Monitoring



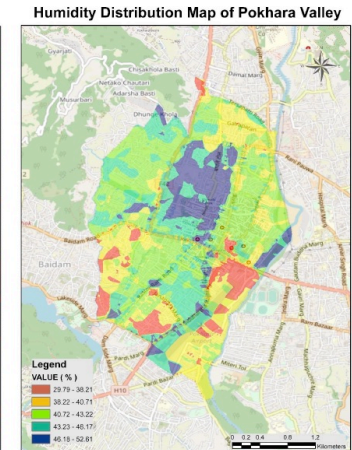
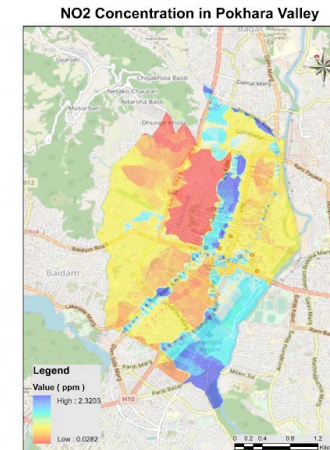
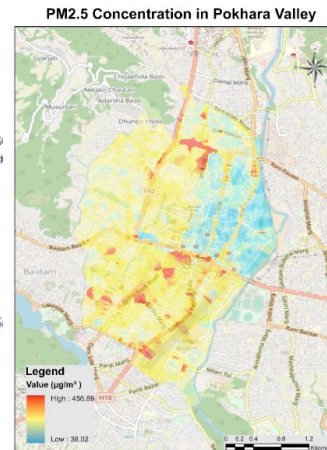
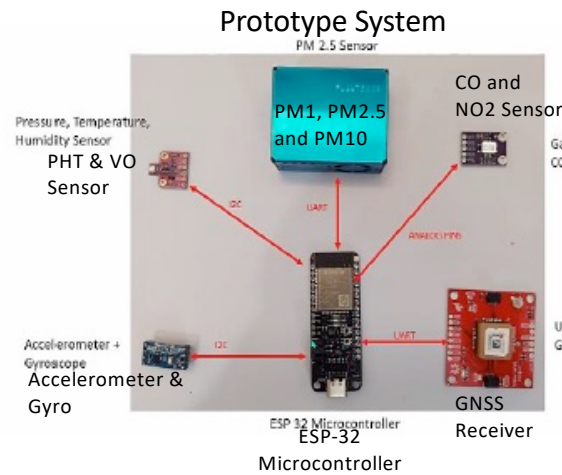
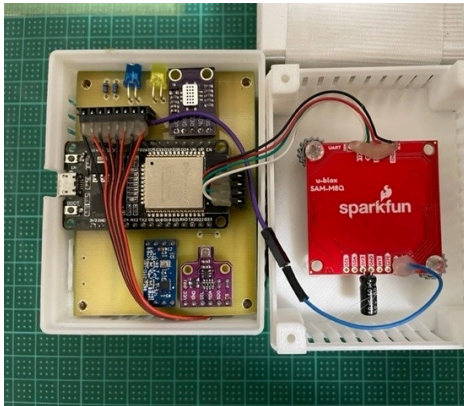
Before Lockdown Period



During Lockdown Period



Photo Sources: https://www.nepaltimes.com/here-now/nepals-smoky-mountains/?fbclid=IwAR31xbeCKSj9_gN0AU7BKMquQAzTg0Z6J-LUTmtsZu9o7o9ozsddu8Z5Vo





A semi-automatic method for crop loss estimation due to monsoon flood using remote sensing data (Funded by UGC)

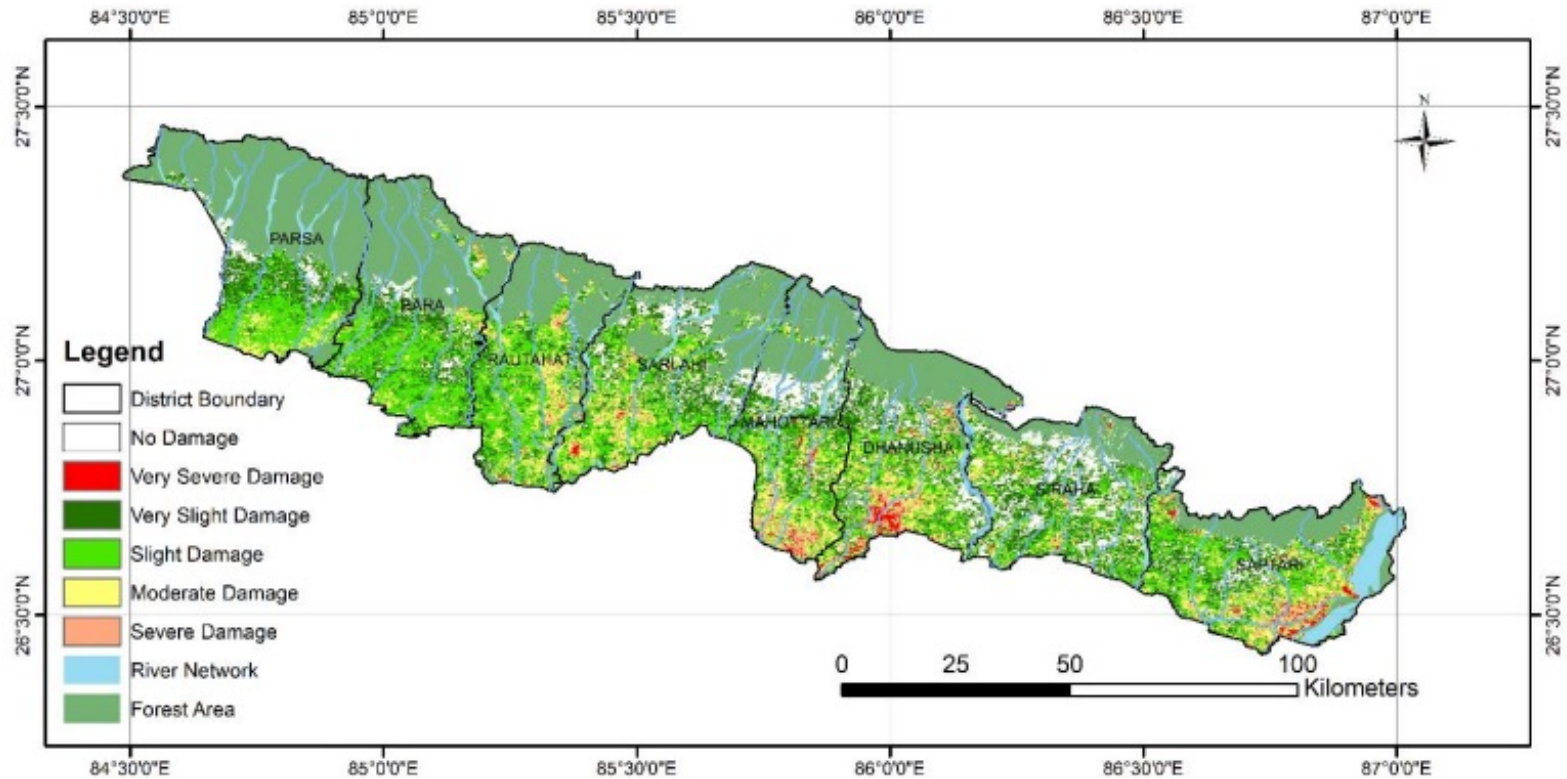


Figure 29 Crop loss in Province 2 in 2020 due to the inundation water.



Integration of Participatory GIS and Local Knowledge for Sustainable Tourism Resource Mapping in Machhapuchchhre Model Trek, Kaski

Faculty Research grants from IIGC

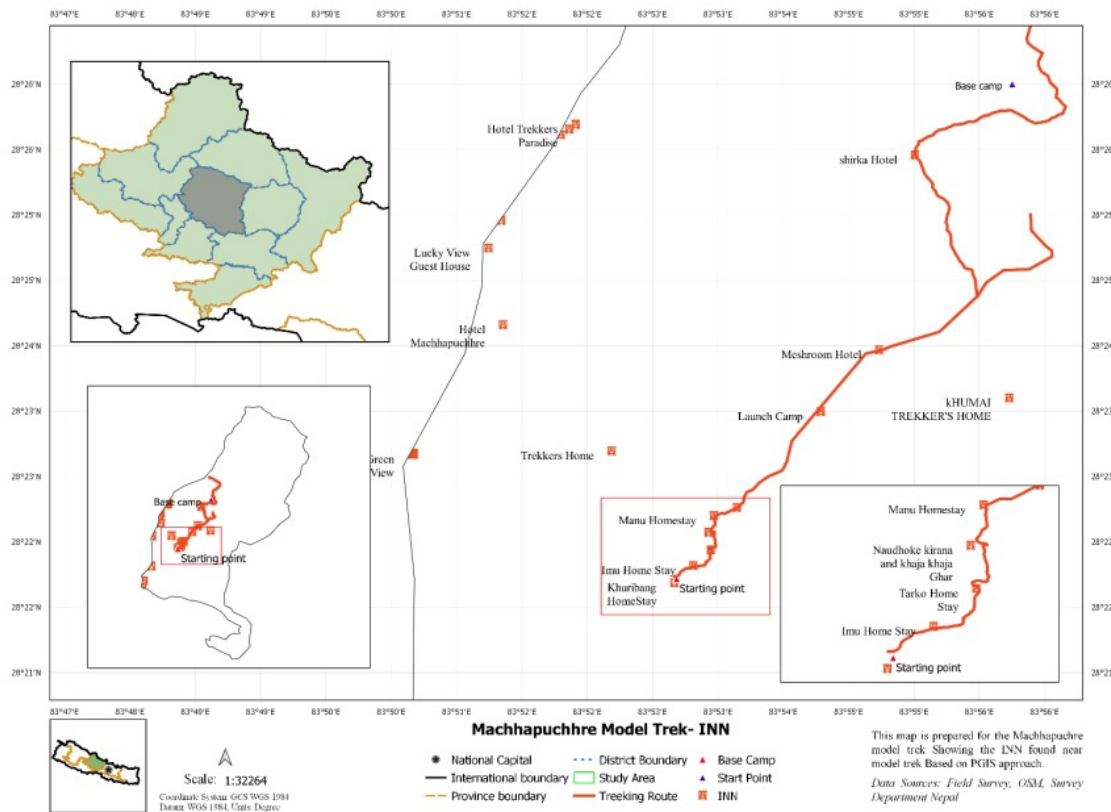


Figure 13 :Hotel and restaurant-based map



GNSS RESEARCH ACTIVITIES

Accuracy Assessment of Low-Cost GNSS Receiver Systems Precision farming, tourism model trek , Drone mapping, Tourism trek

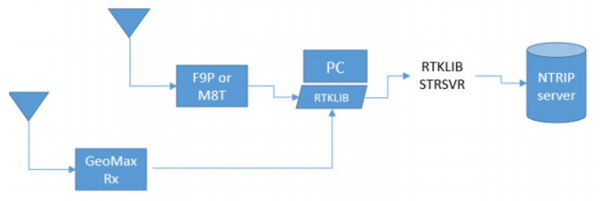


Figure 2: Schematic view of data collection setup for RTK processing.

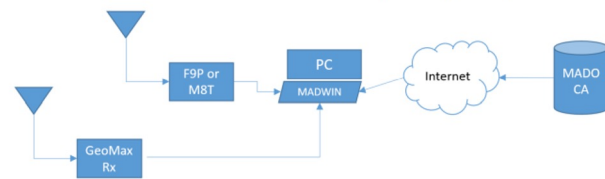
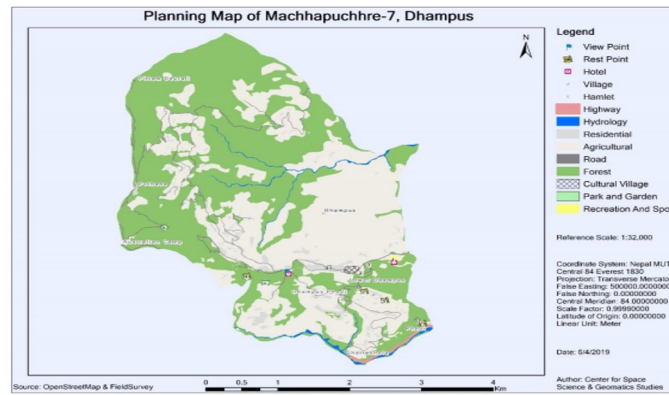
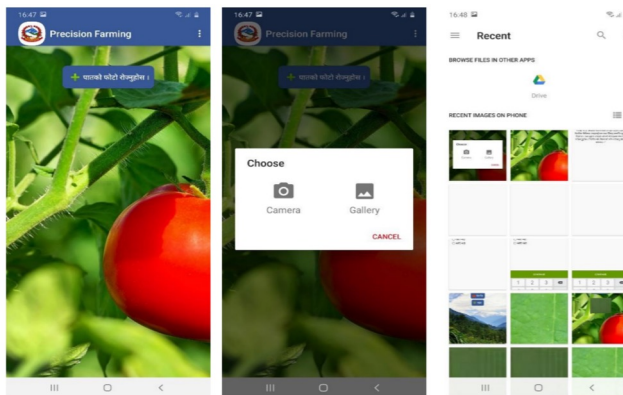


Figure 3: Schematic view of data post-processing using MADOCA correction products.





Publication

- ***Mapping high-resolution seasonal crop pattern using sentinel imagery in mountainous region of Nepal: A Semi-Automatic Approach (MDPI- Geomatics)***
- [Geomatics | Free Full-Text | High-Resolution Mapping of Seasonal Crop Pattern Using Sentinel Imagery in Mountainous Region of Nepal: A Semi-Automatic Approach \(mdpi.com\)](#)



Process in Publication

- Participatory Geographic Information System and Open-Source Data for Sustainable Tourism Management [FOSS4G 2023] Academic Track - Abstract review
- **Under review:**
- Deep Learning for Detection of Irrigation Status in Tomato Plants Using Plant Leaves Journal: International Journal of Intelligent Systems
- **Planned paper:** A semi-automatic method using remote sensing for rice crop loss estimation due to flood.



Center for Space Science and Geomatics Studies (CSSGS)

Future Plans (Research Project)

- Establish and improve infrastructures necessary for GNSS education, research and capacity development.
- Extension of the CORS station (Gandaki Province) collaboration with Ministry of internal affairs and law , Gandaki Province, Survey department and GPAST .
- Multi-year project for the early warning system in Gandaki province collaboration with GPAST, Ministry of internal affairs and law , Gandaki Province and CSIS, The university of Tokyo, Japan

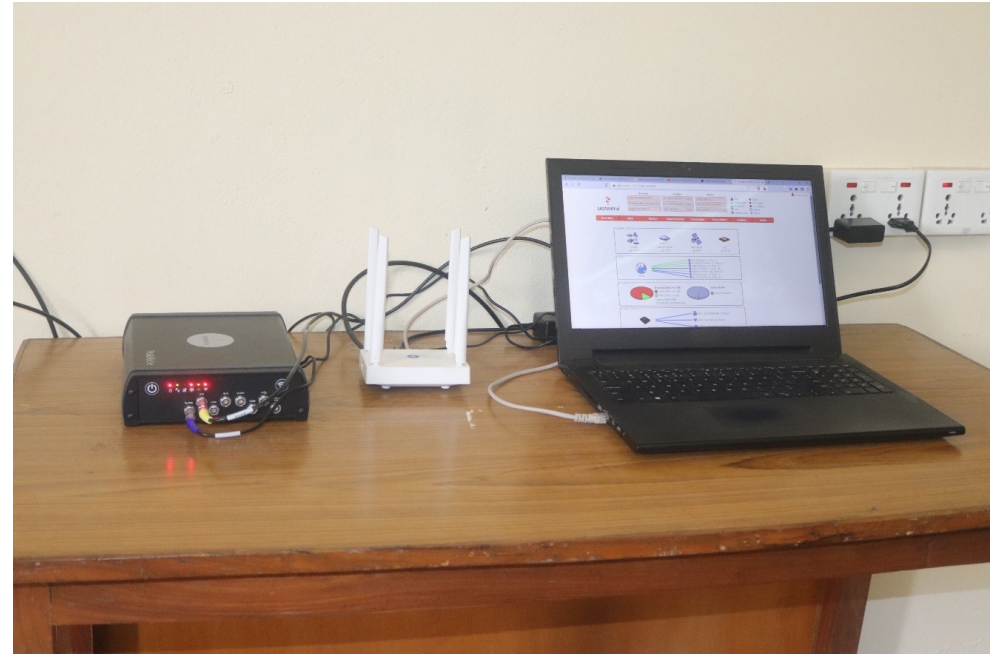


Center for Space Science and Geomatics Studies (CSSGS)

Establishment of CORS station at Pashchchimanchal Campus



CORS Antenna



CORS Receiver: PolarX5

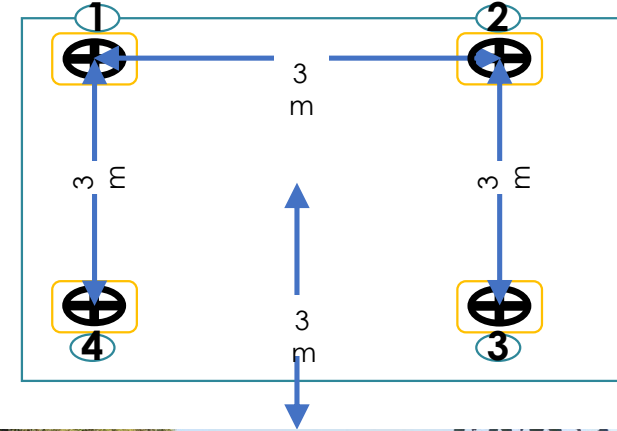
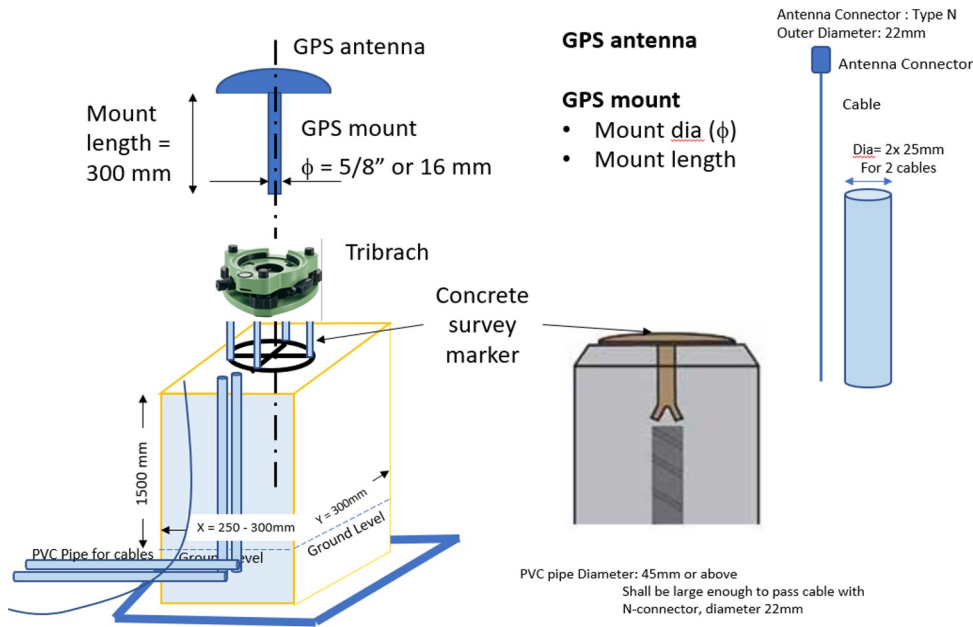
Capable to receive all GNSS signals in all frequencies
Data from this receiver is available for R&D



ESTABLISHMENT OF GNSS LAB

Establishment of GNSS Lab with support from University Grants Commission and CSIS, UTokyo

SETTING UP GPS ANTENNA OVER A BENCHMARK





Center for Space Science and Geomatics Studies (CSSGS)





Collaborative Research and Training Activities

- CSSGS has collaboration with national and international institutes for the establishment and development of the GNSS lab.
- CSSGS has been providing GNSS training in collaboration with
 - International Committee on GNSS (ICG)
 - Center for Spatial Information Science (CSIS), The University of Tokyo
 - University Grants Commission (UGC), Nepal
 - This training has beneficial masters and Bachelor and faculty members



Center for Space Science and Geomatics Studies (CSSGS)

- Extension of GEO portal pilot project of Annapurna-2 rural municipality into whole Annapurna Rural Municipality .
- Collaborative research on " River Flow Velocity, Discharge, and Channel Morphologic Data Acquisition and SWOT-enabled Sedimentation Investigation in the Mobile River Basin in USA and the Gandaki River Basin in Nepal

great news RE: [EXTERNAL] NASA NSPIRES - Proposal has been Submitted to NASA External Inbox x



Hongxing Liu <hongxing.liu@ua.edu>
to Sagy, Lei, Shus@appstate.edu, me, vishnu.pandey@pcampus.edu.np

Fri, Jan 20, 1:53 AM ☆ ↶ ⋮

Hi Sagy, Lei, Song, Krishna, and Vishnu,

I just got the notification that our NASA Terrestrial Hydrology proposal " River Flow Velocity, Discharge, and Channel Morphologic Data Acquisition and SWOT-enabled Sedimentation Investigation in the Mobile River Basin in USA and the Gandaki River Basin in Nepal " has been selected for funding.

I am most excited about this project. I will share more info when it becomes available,

Many thanks to everyone's contribution to this award! Congratulations to everyone!

Hongxing

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Center for Space Science and Geomatics Studies (CSSGS)

Training , Summer School for 2079-2080

- Climbing for Climate GEOspatial School at Pokhara-Nepal Period: December 2023 (Collaboration with International Society for Photogrammetry and Remote Sensing)
- International GNSS training in January, 2024
- End to end UAV/Drone Mapping and Image Processing for GIS data generation Training Program (UGC Budget approve 125,000.00)



Center for Space Science and Geomatics Studies (CSSGS)

Thank You