



APPLICATION OF REMOTE SENSING ON GLOBAL COLLABORATIONS FOR SUSTAINABILITY ON ENVIRONMENTAL EDUCATION

Bipul Chakraborty ¹ & Avijit Patra ²

RESEARCH ARTICLE



Author Details:

¹ Ph.D. Research Scholar, Department of Education, Swami Vivekananda University, Barrackpore, West Bengal, India;

² Student, M.A in Education, Swami Vivekananda University, Barrackpore, West Bengal, India

Corresponding Author:

Bipul Chakraborty

DOI:

<https://doi.org/10.70096/tssr.250307006>

Abstract

Remote sensing utilizes estimations from airplane and satellites to screen the Earth and its natural frameworks. Remote detecting has remarkable capacities to connect spatial scales going from centimetre-sized pixels gathered by drone cameras to worldwide inclusion amassed by lengthy term satellite missions global education. In the topic "Application of Remote Sensing on Global Collaborations for Sustainability on Environmental Education" Research in the School of Climate, Society and Maintainability covers the full range of remote detecting advancements, including UAV imaging, multispectral and hyper spectral remote detecting, radar, and lidar. The paper applies remote detecting to different ecological issues, remembering changes for icy masses and mountain snowpack in light of environmental change, out of control fire and vegetation aggravation, and planning ozone depleting substance discharges. Remote detecting abilities are progressively pursued in different disciplines, with the publication of results on theory, science, applications and technology of remote sensing of Earth resources and environment. Thoroughly interdisciplinary, this journal publishes on terrestrial, oceanic, and atmospheric sensing. districts arranging, scene arranging, and scene nature, rural administration, and ranger service. Electromagnetic energy arriving at the world's surface from the Sun is reflected, consumed or sent. A fundamental supposition made in remote detecting is that particular review targets (various sorts of soils, water having various levels of debasements, rocks of various lithologies, or vegetation of different species) have an individual and trademark way of cooperating with occurrence radiation that is depicted by the otherworldly reaction of that study target.

Keywords: *Remote Sensing, Global Collaborations, Environmental Education, Sustainability, Spatial Scales*

Introduction

In geospatial innovation, remote detecting gathers tests that are produced through electromagnetic radiation and reflected from the World's environmental, earthly, and amphibian biological systems. This takes into account the recognition and observing of the actual attributes of a region without the need to connect with the area. Rather than in situ or on location perception, remote detecting is the most common way of social occasion data about a subject or peculiarities that does exclude having direct actual contact with the subject or occasion being referred to. The expression is utilized specifically while alluding to the method involved with get-together information about Earth and different planets. Most of disciplines that fall under the umbrella of Geology additionally utilize remote detecting topography. A portion of these subjects incorporate topography and land looking over. It additionally has applications in military knowledge, trade, the economy, arranging, and philanthropic work, among different regions. The radiation that is reflected or delivered by a thing or the region around it could be assembled utilizing inactive sensors, which are sensors that respond to outside upgrades. Reflected daylight is the most predominant sort of radiation source that is checked utilizing inactive remote detecting strategies. Charge-coupled gadgets, radiometers, film photography, and infrared are a couple of notable instances of famous sorts of remote detecting.

Background of Study

The investigation of the climate did a way off by means of satellite imaging, ethereal photography, and radar is a remote detecting climate. By taking readings of electromagnetic waves, far off sensors can acquire data. Distributing research discoveries on the hypothesis, science, applications, and innovation of remote detecting of the climate offers a support to the local area of individuals who work in remote detecting. Perception satellites of the Earth, frequently known as remote detecting satellites, are one more name for remote detecting satellites. They may likewise be utilized for ecological observing, meteorology, and planning,

notwithstanding their job as spy satellites. The most predominant kind is Earth-imaging satellites, which catch pictures from space very like those taken from planes. Remote detecting of the climate is utilized by Some EO satellites that can do as such without creating pictures, likewise with GNSS radio occultation. Dynamic and latent remote sensing are the two essential classifications of remote detecting, each arranged by the wellspring of sign used to examine an article. Dynamic remote detecting gadgets produce their wellspring of outflow or light to work, instead of uninvolved instruments, which rely upon the reflected one.

Objectives of the Study

1. To know the benefits remote sensing on the application of environmental education.
2. To know how Remote Sensing Evaluate Ecological Effect in Environmental Education.

Research Questions of the Study

1. What are the benefits of remote sensing on the application of environmental education?
2. How Remote Sensing Evaluate Ecological Effect in Environmental Education?

Review of Related Literature

Zhang, Chuanrong; Li, Xinba (September 2022), While doing remote detecting, every dynamic sensor initially conveys its message to the objective thing and afterward looks at the reaction, otherwise called the got sum. Microwaves are utilized in by far most of gadgets since they are impervious with the impacts of climate generally. Wang, R.; Gamon, John A. (2019), Different dynamic remote detecting strategies might be arranged by what they broadcast (light or waves), as well as what they decide. It alludes to a sensor that helps range utilizing radio frequencies. Recognized by the motivations are transmitted by the radio wire. Makki, Ihab; Younes, Rafic; Francis, Clovis; Bianchi, Tiziano; Zucchetti, Massimo (2017), at the point when the energy stream in radar dynamic remote detecting comes into contact with a check, some portion of that energy is dissipated back to the sensor. It is feasible to assess the distance to the goal in light of the absolute expense and the time it takes to show up there. Zhao, Kaiguang; Suarez, Juan C; Garcia, Mariano; Hu, Tongxi; Wang, Cheng; Londo, Alexis (2018). It is utilized during the time spent deciding distance in the lidar. Communicating light driving forces and dissecting the sum gathered are both required strides in the Lidar dynamic remote detecting process. At the point when how much time is increased by the speed of light, the distance and position of the objective might be determined. Bayindir, C.; J. D. Frost; C. F. Barnes (January 2018), A lidar-based laser altimeter is utilized to gauge rise. The distance between two focuses not entirely set in stone by going instruments utilizing possibly a couple of comparative gadgets mounted on discrete stages that send signs to one another. Rocchini, Duccio; Boyd, Doreen S.; Féret, Jean-Baptiste; Foody, Giles M.; He, Kate S.; Lausch, Angela; Nagendra, Harini; Wegmann, Martin; Pettorelli, Nathalie (2016), Sounder examines the upward conditions of the weather conditions by conveying motivations on the off chance that it has a place with the dynamic classification. Stewart, J.E.; et al. (2014). Beside the numerous manners by which they might be executed, dynamic distant sensors basically have no imperatives with regards to the conditions of the review. Corradino, Claudia; Ganci, Gaetana; Bilotta, Giuseppe; Cappello, Annalisa; Del Negro, Ciro; Fortuna, Luigi (2019), Dynamic remote detecting frameworks are totally utilitarian over the course of the day since they don't require daylight and are generally free of air scatterings. Detached sorts of remote detecting frameworks possibly work when daylight is available. Makki, Ihab; Younes, Rafic; Francis, Clovis; Bianchi, Tiziano; Zucchetti, Massimo (2017), As opposed to their dynamic partners, aloof remote detecting sensors don't move any of their inward energy to the thing or surface being examined. The reflected regular energy, like daylight, is the wellspring of data for aloof remote detecting. Due to this need, it must be utilized when there is adequate daylight; if not, there will be no light to reflect. In uninvolved remote detecting, multispectral or hyperspectral sensors are utilized to get estimations of the objective sum utilizing different band setups. The quantity of diverts in every one of these blends makes them special. The scope of groups incorporates unearthly reaches that are both noticeable and imperceptible to the natural eye.

Methodology of the Study

Study Design

Scope and Focus: The research should focus on the integration of remote sensing tools in educational initiatives aimed at sustainability, with a global or regional collaborative approach. Select regions or countries that are facing common environmental challenges (e.g., deforestation, desertification, climate change). Consider partnerships with international organizations, NGOs, and educational institutions.

Data Collection Methods

- **Qualitative Data**
Interviews, focus groups, and surveys with stakeholders (teachers, students, NGOs, community members) about their understanding and use of remote sensing data.
- **Quantitative Data**
Pre- and post-surveys to measure changes in knowledge and awareness, as well as the impact of remote sensing tools on sustainable practices.
- **Remote Sensing Data**
Satellite imagery, aerial data, and environmental datasets (from sources like NASA, ESA, or commercial providers) for analysis of environmental parameters.

Data Collection

Remote Sensing Data

- Utilize satellite images from platforms like Landsat, Sentinel for global or regional monitoring of environmental indicators.
- Collect geospatial data on vegetation cover, water bodies, land use, and pollution levels for educational purposes.
- Access data on environmental changes (e.g., deforestation, sea-level rise) and trends in biodiversity or climate patterns.

Educational Data

- Collect data from teachers and students involved in the project regarding their usage of remote sensing tools in the classroom.
- Develop educational material or modules based on remote sensing data (interactive lessons, activities, and projects).

Collaboration Data

- Document the processes and mechanisms of cross-border collaboration: communication tools, knowledge sharing, collaborative platforms, and joint initiatives.

Educational Impact Analysis

- Analyze survey and interview responses to measure the effectiveness of remote sensing in enhancing environmental education.
- Evaluate the increase in knowledge and sustainability awareness through statistical comparison of pre- and post-surveys.
- Assess the level of engagement and collaboration between stakeholders (students, educators, international partners).

Qualitative Analysis

- Thematic analysis of interviews and focus group discussions to understand the challenges and successes of using remote sensing in environmental education.
- Analyze feedback from educators about how well remote sensing data helps in teaching sustainability.

Analysis and Interpretation of Study

To know the benefits remote sensing on the application of environmental education

Benefits of Environmental observing by Remote Sensing

An exceptionally sure viewpoint comparable to ecological checking by remote detecting is the way that there are presently different dynamic satellite missions that openly or industrially furnish information and pictures with various qualities and spatial, phantom and fleeting goals. These missions include: Landsat of the Public Flying and Space Organization (NASA), Sentinel of the European Space Organization (ESA) and CBERS of a Brazil and China organization, which freely give memorable series of pictures gathered, as normalized items in georeferenced documents, fit to be consumed by the last client. One more significant perspective is the accessibility of a rising number of sensors with various qualities, which permits the assortment of a wide assortment of sorts of information and pictures, growing the potential open doors for applications for ecological observing.

The principal sorts of sensors involved and their attributes and applications for ecological observing are introduced in the outline underneath Gathers data in the noticeable and close to infrared unearthly reaches and in short waves. The sun is the principal wellspring of energy utilized in this sort of imaging, which can gather pictures during the day. The cycle experiences under specific weather patterns and can't gather pictures in shady circumstances. This is viewed as a functioning sensor, and has its own energy sources, and is hence equipped for gathering information around evening time. It registers energy in the microwave range and can gather data paying little mind to meteorological circumstances. This is viewed as a functioning sensor, and has its own wellsprings of energy, and is subsequently fit for gathering information around evening time.

It can gather data paying little mind to meteorological circumstances. Observing of quantitative parts of vegetation (like concealment and recovery) and subjective ones (like discovery of types of interest) Checking of water quality observing of erosive cycles. Observing of biomass and woods carbon Checking of quantitative and subjective parts of vegetation Checking of development of masses Remote sensing innovation is either dynamic or latent: dynamic significance the innovation works with its own wellspring of outflow or light and detached importance it depends on mirrored light from the sun. Utilizing detecting instruments, remote detecting change location information can be created to think about and break down at least two pictures taken at various times in a similar region to distinguish changes in elements of the world's surface. This can yield significant data. For instance, remote detecting symbolism can be created and examined after some time to show deforestation, screen yields or measure the dampness content of soil.

To know How Remote Sensing Evaluate Ecological Effect in Environmental Education

The force of joining geoscience and remote detecting is to empower researchers to more readily comprehend the association between the Earth and its current circumstance and human exercises like turn of events. It utilizes information gathered from remote detecting exercises like satellite, radar innovation and actual displaying to check out at influences on the seas, backwoods and the result of cataclysmic events.

The remote detecting of discharges, for example, methane additionally can possibly assist with handling environmental change. The capacity to screen methane discharges from oil and gas creation from a remote detecting satellite in space has been examined as a likely method for bettering screen and comprehend accidental outflows and assist with relieving environmental change.

Assuming you are searching for a functioning remote detecting innovation that can quantify your effect on the climate, safeguard the wellbeing and security of your laborers, increment efficiency, and give clear, constant information of your site, then Geoidal is an ideal answer for you. Get in touch with us today for your free, live demo. We can hardly stand by to show you how this tech will reform your activity. Comparable to the mechanical patterns as information obtaining with remote detecting we can feature the approach and escalated utilization of nanosatellites. These are small scale satellites that can be worked as groups of stars, growing the type of imaging of the World's surface in a manner previously unheard of. One effective case is that of the California based organization Planet, which works more than 150 nanosatellites coordinated in various star groupings, and gives information and items in an extraordinary blend of high spatial goal and recurrence of envisioning. These various wellsprings of symbolism are called multitemporal remote detecting information, which are pictures from something very similar or numerous sensors gathered in similar area at various times to help in change recognition. When joined with examination programming, or even Geographic Data Framework (GIS) programming, remote detecting information and multitemporal information can be dissected and introduced in a diagram or guide structure to assist with distinguishing spatial examples and connections. Information that can be inputted into a GIS PC innovation incorporates maps, elevated photos, review information and computerized information gathered from satellites. These sorts of data can then be scaled and overlaid on top of each other to shape a solitary guide, taking into consideration simpler and more educated examination.

Cross-Border Collaboration and Feedback

Global Collaboration Platforms

- Facilitate online platforms for real-time collaboration where educators and students from different countries can share and discuss remote sensing data.
- Use platforms such as Google Classroom, Moodle, or dedicated GIS platforms for cross-border educational collaboration.
- Promote sharing of data and insights related to environmental sustainability through webinars, workshops, and online courses.

Feedback Loops

- After implementing the educational modules, collect feedback from participants (students, educators, and stakeholders) to refine and improve the program.
- Use follow-up surveys to assess the long-term impact of remote sensing education on sustainability practices in different regions.

Dissemination of Results

- **Publish Outcomes**
Share the research findings in academic journals, conferences, or through international platforms (e.g., UN Environment, UNESCO) to advocate for the broader use of remote sensing in sustainability education.
- **Public Awareness Campaigns**
Use the results to launch public education campaigns that utilize remote sensing imagery to visualize pressing environmental issues like deforestation, water scarcity, or air pollution. Findings of the study as a Remote Sensing Applications
- **Land Use Planning**
It is useful to gain a modern land use example of expansive locales at any second utilizing remote detecting geology information. This information may likewise be utilized to screen changes that happen every once in a while. Guides of streets, black-top circumstances, and the limits of wetlands may be generally raised to date with its assistance. Territorial organizers and overseers utilize this data while planning strategy measures to work with far reaching development across the area.
- **Weather Conditions Determining**
The performance of weather conditions determining in India utilizes remote detecting innovation. Also, it is used to give individuals advance notice of moving toward typhoons.
- **Ecological Review**
Deforestation, the disintegration of fruitful grounds, contamination in the air, desertification, eutrophication of immense water bodies, and oil slicks from oil big haulers are a portion of the ecological issues that might be explored with its assistance.
- **Investigation of Normal Risks**
The utilization of remote detecting considers the examination of harm welcomed on by catastrophic events like seismic tremors, volcanoes, avalanches, floods, and the softening of ice in polar regions. The utilization of remote detecting may frequently be utilized while endeavoring to conjecture the approach of catastrophic events.

- **Asset Investigation**

The utilization of remote detecting information is significant for distinguishing petroleum derivative stores, quickly getting ready lineament and structural guides, recognizing regions for quarrying minerals, and refreshing existing topographical guides. Likewise, remote detecting information is valuable for refreshing existing geographical guides.

- **Utilizations Of Remote Sensing in Educational Aspect**

These sorts of information might be put to use during the time spent devising strategies for use both when normal fiascoes. The framework is particularly significant for ecological observing and the administration of normal assets. Likewise, it examines people's effect on the general climate. Oceanography is another field that might profit from remote detecting since it screens sea flow, temperature, and wave levels to get a more profound comprehension of sea assets. The technique has applications in topography, mineral investigation, farming, and ranger service.

- **Restrictions of Remote Sensing**

The goal of the photos acquired by satellites could frequently be too low to even consider recognizing small differentiating areas and do thorough planning. Deciphering the information got is troublesome, tedious, and costly, and the estimation vulnerability is frequently critical.

Recommendations for Policy and Practice

- Provide recommendations for governments, educational institutions, and NGOs to incorporate remote sensing data into sustainability curricula.
- Suggest policies that promote cross-border collaboration in environmental education through the use of geospatial technology.
- Encourage the creation of international platforms that allow for the sharing of remote sensing data, enabling global educational projects on sustainability.

Conclusion

This research methodology provides a comprehensive framework for investigating the application of remote sensing in global collaborations for sustainability in environmental education. The combination of geospatial data, global partnerships, and educational initiatives offers an innovative way to address critical environmental challenges while fostering a deeper understanding of sustainability practices across borders. By utilizing remote sensing tools, the methodology aims to inspire a more informed, connected, and sustainable global community. Individuals can get data about the Earth by means of the utilization of remote detecting. It is accordingly vital for the assessment of dangers, as well as the checking of land corruption and the conservation of normal assets. The framework screens outrageous climate occasions like tropical storms, quakes, and floods, and the information got might be handled to give an investigation of the harm brought about by catastrophic events. The costs related with working a remote detecting framework might be somewhat high, especially for more modest and less created countries with restricted monetary assets, innovative holes, and a deficiency of instructed representatives. The portrayal of spatial information on maps has turned into an undeniably important instrument in ecological preparation and the board. Information examination methods have developed according to illustrative to point of view maps that show spatial connections on a visual data stage that we as a whole currently allude to as Geological Data Frameworks .Where GIS addresses strong toolsets that are utilized for changing and showing certifiable spatial information; remote detecting information recovered via air and space found sources gives quite a bit of this significant information for planning and natural administration and arranging. Remote sensing is the study of acquiring data about the Earth utilizing high-flying airplane and satellites. The information is gathered by sensors connected to the airplane that identify the energy that is reflected from Earth. Far off sensors fall into two groupings uninvolved and dynamic. Because of outer upgrades, aloof sensors record the normal energy transmitted from the World's surface. Reflected daylight is the most well-known wellspring of recognized radiation. Dynamic sensors contrast in that they utilize inner upgrades to gather information. A typical model is the utilization of a laser-pillar remote detecting framework, where information is gathered by extending a laser to the World's surface and estimating the time it takes for it to be reflected back to the sensor.

Acknowledgment: No

Author's Contribution: *Bipul Chakraborty:* Data Collection, Literature Review, Methodology, Analysis, Drafting, Referencing; *Avijit Patra:* Data Collection, Literature Review, Methodology, Analysis, Drafting, Referencing.

Funding: No

Declaration: All the authors have given consent for the publication.

Competing Interest: No

References

1. Bayindir, C., Frost, J. D., Barnes, C. F. (January 2018). Assessment and enhancement of SAR noncoherent change detection of sea-surface oil spills. *IEEE J. Ocean. Eng.* 43 (1): 211–220. Bibcode:2018IJOE...43.211B. doi:10.1109/JOE.2017.2714818. S2CID 44706251

2. Corradino, C., Ganci, G., Bilotta, G., Cappello, A., Ciro, D. N., Fortuna, L. (2019). Smart Decision Support Systems for Volcanic Applications. *Energies*. 12 (7): 1216. doi:10.3390/en12071216
3. Makki, I., Younes, R., Francis, C., Bianchi, T., Zucchetti, M. (2017). A survey of landmine detection using Hyperspectral imaging. *ISPRS Journal of Photogrammetry and Remote Sensing*. 124: 40–53. Bibcode:2017JPRS.124...40M. doi:10.1016/j.isprsjprs.2016.12.009. ISSN 0924-2716
4. Rocchini, D., Boyd, D., Féret, J. B., Foody, G. (2016). Skidmore, Andrew; Chauvenet, Alienor (eds.). Satellite remote sensing to monitor species diversity: potential and pitfalls. *Remote Sensing in Ecology and Conservation*. 2 (1): 25–36. Bibcode:2016RSEC....2...25R. doi:10.1002/rse2.9. hdl:11585/720672. ISSN 2056-3485. S2CID 59446258
5. Stewart, J.E. (2014). Finescale ecological niche modeling provides evidence that lactating gray seals (*Halichoerus grypus*) prefer access to fresh water in order to drink (PDF). *Marine Mammal Science*. 30 (4): 1456–1472. Bibcode:2014MMamS.30.1456S. doi:10.1111/mms.12126. Archived (PDF) from the original on 13 July 2021. Retrieved 27 October 2021
6. Wang, R., Gamon, J. A. (2019). Remote sensing of terrestrial plant biodiversity. *Remote Sensing of Environment*. 231: 111218. Bibcode:2019RSEnv.23111218W. doi:10.1016/j.rse.2019.111218. ISSN 0034-4257. S2CID 197567301
7. Zhang, C., Li, X. (2022). Land Use and Land Cover Mapping in the Era of Big Data. *Land. Feature Papers for Land Innovations – Data and Machine Learning 11* (10): 1692. Bibcode:2022Land...11.1692Z. doi:10.3390/land11101692
8. Zhao, K., Suarez, J. C., Garcia, M., Hu, T., Wang, C., Londo, A. (2018). Utility of multitemporal lidar for forest and carbon monitoring: Tree growth, biomass dynamics, and carbon flux. *Remote Sensing of Environment*. 204: 883–897. Bibcode:2018RSEnv.204.883Z. doi:10.1016/j.rse.2017.09.007

Publisher's Note

The Social Science Review A Multidisciplinary Journal remains neutral with regard to jurisdictional claims in published data, map and institutional affiliations.

©The Author(s) 2025. Open Access.

This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>