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Remote Sensing is used to Quickly Assess Changes in Forest Cover and Inform Forest Management

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Introduction

Both natural processes and human activity affect how land is used and covered, but in many parts of the world over the past century, human activity has had a much greater impact. By examining Landsat pictures, this study makes an effort to determine how the land cover of Bangladesh's Sundarbans and nearby areas has changed over the past 40 years. The biggest remaining area of mangrove forest on earth, Sundarbans is threatened on many different fronts by deterioration. It has the richest and most remarkable biodiversity. Landsat time series photos for the years 1980 (MSS), 1990 (TM), 2000 (TM), 2010 (TM), and 2020 were obtained (OLI). Using the ArcMap 10.5 programme, the classified pictures are analysed, compared, and shown to show the historical trend of land cover change in the study area [1].

Several literary sources have reported on Nepal's extensive deterioration and deforestation. Community forests (CF) have improved the amount of forest cover and its condition in the Mid-hill region of Nepal, but further research is needed to fully grasp the issue. The study area (Tanahun District) is located in western Nepal's Gandaki Province. This study's goals were to calculate the change in forest cover during the given time period and discover the variables that affected it. We classified land use and land cover using Landsat data from 1976, 1991, and 2015. To comprehend the many causes of forest cover change, we took into account both community perception and the forest cover map [2].

High socioeconomic and ecological value forest ecosystems are under threat from both biotic and abiotic changes. The frequency and intensity of disturbances are sadly expected to rise even more in the near future as a result of the ongoing climate change. Because of this, creating a suitable Forest Monitoring Information System for Europe (FISE) is a top priority. The establishment of a FISE that addresses many disturbances simultaneously while relying on the same IT infrastructure and datasets is advised in order to take advantage of synergies and prevent needless duplication of effort and innovations. Beyond economies of scale, ensuring consistency and interoperability across the many forest information layers is crucial from the user's perspective. By analysing the relevant scientific literature and describing current operational or experimental approaches at the European and worldwide levels, the potential contribution of (satellite-based) Earth Observation (EO) to such a monitoring system is critically evaluated in this desk study. In order to learn more about forest remote sensing efforts in the EEA 39 countries, a survey of members of the EIONET National Reference Centers on Forests was also performed. Colleagues from the European Environment Agency (EEA), the European Joint Research Center (JRC), the Brazilian Institute for Space Research (INPE), and the US Forest Service supplied complementary information that was extremely beneficial [3].

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Description

Wild fires

One of the most frequent disturbances to forest ecosystems is wildfire. It is anticipated that as a result of continued climate change, wildfires would occur more frequently, burn hotter, and last longer. EO-based monitoring systems should focus on three phases: before the fire (pre-fire), during the fire (active), and after the fire to prevent ignition and lessen the damage of wildfires (post-fire). Remote sensing can help in wildfire management at any stage. Optical sensors are particularly well suited. Knowing the different fuel types (for example, tree species) and their circumstances is crucial for lowering the risk of ignite. With the right meteorological data and information on the forest's structure (such as gap-size distribution and vertical forest structure), this information can be easily inferred from optical datasets from Sentinel-2 [4].

Pests and illnesses can affect forests. In the past, bark beetle infestations as well as those caused by fungi and the insects that carried those fungi caused significant forest losses. Although it is normal for native organisms to prey on trees, improper forest management techniques and climate change can disturb the equilibrium. Both of these elements can significantly boost forests' propensity to health problems In fact, the majority of larger bark beetle outbreaks occur after earlier disturbances caused by droughts or fires, and they are further aided by massive, uniformly aged, poorly adapted monocultures. Early detection of infestations is essential to prevent widespread breakouts and reduce economic losses, i.e., before the infestation becomes visible on the ground (at the so-called "green-attack" stage) [5].

EO approaches based on optical data can offer helpful indicators for both information requirements. Although it is generally ideal to address risk assessment at the stand level where appropriate methodologies and datasets (such as Sentinel-2) are available, the actual detection of infested trees - in particular in the green-attack phase - is still important. Must be carried out at the level of specific trees. There isn't yet a sensor that is appropriate for this most important task. Furthermore, it is still unknown if future study will be able to identify reliable "spectral fingerprints" (as opposed to "spatio-temporal fingerprinting") that enable unmistakable differentiation between reversible (weather-related) vegetation aberrations and green-attacks. Extremely low lag times are needed for preventive measures and to limit the spread, which further complicates the process.

There are a number of ways that can be used, utilising a variety of different sensors and methods, to portray the spatial extent and severity of droughts. Satellite sensors are especially effective at addressing the meteorological, hydrological, and agricultural types of droughts out of the four general categories of drought. A simple description of the weather, such as rainfall deficiencies, is rarely adequate in the soil. Due to the dense vegetation cover and low signal-to-noise ratio, soil moisture retrievals employing active and passive microwaves are typically also accompanied by large uncertainty. Due to this, it is usually best to observe vegetation conditions in the optical domain (such as when evaluating the so-called "agricultural drought"). The European FISE will have a strong foundation thanks to the existing and upcoming Copernicus products, which can deliver impartial, fast, and trustworthy forest information. A growing number of policies relating to agriculture, the environment, and the climate specifically specify the use of Copernicus data to track the implementation of the policy measures, underscoring the importance of Copernicus for European policy making. A variety of acceptable land cover and land use products are currently available for this purpose through the Copernicus Land Cover Monitoring Service (CLMS). To facilitate, for instance, future Land Use, Land Use Change, and Forestry sector (LULUCF) reporting by the Member States, the portfolio must be enlarged. There are corresponding requirements, such as for better spatial detail and more frequent updates.

Conclusion

Products from the Copernicus Emergency Management Service can also be used to support forest policies related to forest disturbances (CEMS). Risk maps that detail exposure and vulnerabilities and hazard maps that provide information on events and their impact are two examples. A further element aiding in forest management is the European Forest Fire Information System (EFFIS). Future Copernicus services, such a phenology service offered by the CLMS, will provide more information for tracking forest disturbance. Additionally, the services will offer data for the creation of forest-related policies for their mitigation and allow for the monitoring of their effective implementation throughout Europe.

Acknowledgement

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Conflict of Interest

None.

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