Global Carbon Sinks: Remote Sensing for Peatland Restoration

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Peatland ecosystems are the largest natural terrestrial carbon store on earth. Healthy peatlands act as carbon sinks, trapping atmospheric CO2 as soil organic matter. However, anthropogenic disturbances such as drainage and peat extraction have turned many peatlands into carbon sources. Worldwide efforts are needed to restore and rehabilitate peatlands to meet the challenges of reducing greenhouse gas emissions and tackling biodiversity loss. For such efforts to succeed a cost-effective, widescale approach for monitoring, reporting, and validation of peatland rehabilitation is needed. This study uses a novel open-source multi-sensor remote sensing (multispectral, Synthetic Aperture Radar (SAR), and Interferometric SAR) approach to monitor the effectiveness of peatland rehabilitation in Ireland. Multi-sensor observations from six pilot sites were examined, representing a range from heavily degraded to largely intact sites. Multispectral analysis, through supervised classification, identified vegetation and moisture content changes in both restored and degraded sites but was limited by cloud cover. SAR analysis successfully showed changes in soil moisture and waterlogging, key factors for successful rehabilitation. The surface motion detectable from InSAR provided a valuable insight into rehabilitation effectiveness, such as reduced subsidence rates and positive ground elevation changes. The study demonstrates multi-sensor remote sensing has the potential to provide cost-effective monitoring for peatland rehabilitation and restoration at a local, regional and global scale. This approach supports nations in meeting their Paris Agreement and 2030 Climate and Energy Framework commitments by providing comprehensive insights into restoration progress and carbon sequestration.