ESG-Pro

Copernicus location intelligence for ESG criteria quantification and monitoring at property level

Programm / Ausschreibung	ASAP, ASAP, ASAP 18. Ausschreibung (2021)	**Status**	abgeschlossen
Projektstart	01.09.2022	**Projektende**	31.08.2024
Zeitraum	2022 - 2024	**Projektlaufzeit**	24 Monate
Keywords	Copernicus; sustainable investment, environmental, social and governance (ESG) criteria; ESG operationalization; property monitoring; locational intelligence, EO data cubes		

Projektbeschreibung

Internationale Leitlinien zwingen die Regulierungsbehörden dazu, Environmental-, Social- und Governance-Kriterien (ESG) unter dem Begriff "nachhaltige Investitionen" zu quantifizieren, insbesondere im Einklang mit der EU Verordnung 2020/852 über die Taxonomie der nachhaltigen Finanzen. In diesem Zusammenhang brauchen InvestorenInnen mehr Klarheit, um ESG-Bewertungen vornehmen zu können und sowohl Unternehmen als auch KundInnen müssen die Auswirkungen ihrer Investitionen verstehen. Der Flaschenhals sind derzeit verlässliche Daten zu ESG-Kriterien, insbesondere auf der Ebene einzelner Grundstücke und Assets.
Das Projektkonsortium analysiert Geodaten, insbesondere Copernicus Erdbeobachtungsdaten um diese Datenlücken zu schließen. Das Ziel dieses F&E Projekts ist, konsistente und granulare Indikatoren für ESG-Kriterien zu entwickeln, die:
- objektiv, unabhängig, überprüfbar und von hoher Qualität auf der Ebene einzelner Grundstücke anwendbar sind;
- regelmäßig aktualisiert werden (d. h. für die Überwachung von Veränderungen geeignet sind);
- umfassend sind, d. h. eine globale Abdeckung ermöglichen.
Um dieses ambitionierte Ziel zu erreichen, werden wir - basierend auf den von den LoI-ProjektpartnerInnen definierten Bedürfnissen der EndnutzerInnen - Sentinel 1 und Sentinel 2 Daten sowie bestehende Copernicus-Services bzw. -Produkte analysieren, um ESG-Kriterien systematisch zu quantifizieren. Unter Nutzung des Potenzials von “Earth Observation (EO) Data Cubes” als effizientes Datenmanagement- und Abfragesystem werden wir die Ergebnisse mit hochauflösenden kommerziellen Daten vergleichen. Die mit den im Rahmen des Projekts entwickelten Methoden gewonnenen Informationen werden unter Berücksichtigung der damit verbundenen Kosten mit anderen bestehenden Methoden verglichen. Wir werden diese EO-basierten Informationen mit anderen Geodatensätzen kombinieren, um eine "location Intelligenz" aufzubauen und Daten zu ESG-Kriterien auf der Ebene von Vermögenswerten (z. B. Grundstücke, Fabriken, Bergwerke) bereitzustellen.
Im ESG-Pro Projekt schließen sich drei KMUs aus verschiedenen Bereichen und eine Universität zusammen, um eine faktenbasierte Methodik zur Erstellung von ESG-Ratings auf der Grundlage von (überwiegend offenen) EO- und GI-Daten zu entwickeln. Mehrere Banken und Beratungsunternehmen haben ihre aktive Teilnahme an den Projektworkshops zugesagt, da sie ab 2024 ihre ESG-Ratingmethoden offenlegen müssen. Auch wenn dieses Projekt stark forschungsorientiert ist, besteht nachweislich ein hohes Marktpotenzial nach der regulatorischen Änderung im Jahr 2024 und darüber hinaus und die PorjektpartnerInnen wollen die Zusammenarbeit über dieses Forschungsprojekt hinaus fortsetzen und gemeinsam die

Ergebnisse in die industrielle Entwicklung überführen.

Abstract

International guidelines force regulators to quantify environmental, social and governance (ESG) criteria under the term “sustainable investment”, especially in compliance with the sustainable finance taxonomy regulation (EU) 2020/852. Investors need greater clarity to make ESG assessments, while both companies and consumers need to understand their investments’ impacts. Reliable data related to ESG criteria is currently a bottleneck, particularly at the asset level.
This consortium analyses geospatial data sets and proposes the analysis of Earth Observation (EO), particularly Copernicus data sets, to generate the insights that these regulations demand. We will perform research to develop consistent, granular indicators for ESG criteria that are:
· objective, independent, verifiable and of high quality at a single property scale;
· updated regularly (i.e. useful for change monitoring);
· comprehensive, providing large-scale, country-level coverage anywhere worldwide.
To achieve this, we will analyze Sentinel-1 and Sentinel-2 data and Copernicus service products to systematically quantify ESG criteria based on end user needs as defined by Litter if Intend (LoI) project partners. Utilizing the potential of EO data cubes as an efficient data management and querying system, we will compare the results against high-resolution commercial data. The information gained from the methods developed within the project will be compared to other existing methods, taking into account associated costs. We will combine this EO-based information with other geospatial datasets towards building ‘locational intelligence’ and providing data on ESG criteria at the asset level (e.g. factory, mine, field, retail estate).
Three SMEs from different fields and one University Department join forces to establish a fact-based methodology for generating ESG ratings based on (predominantly open) EO and Geoinformation (GI) data. The intention is to continue collaboration towards a follow-up joint venture. Several banks and consultancies have assured their active participation in project workshops because they are mandated to disclose their ESG rating methods starting in 2024. Even though this project is heavily research oriented, there is a documented high market potential following the regulatory change in 2024 and beyond.

Endberichtkurzfassung

The ESG-Pro project aimed to develop a geospatial framework for evaluating ESG (Environmental, Social, and Governance) criteria at the property level using Copernicus satellite data and other geospatial datasets. The project focused on creating methodologies to monitor land use, vegetation, and urban development. The results demonstrated the potential of integrating Sentinel-1 and Sentinel-2 data for ESG monitoring, while also highlighting challenges related to data resolution, validation, and integration into real-world applications.

The project developed two primary methodologies: the Green Impact Score and the Built-up Checker. The Green Impact Score used Sentinel-2 data to assess vegetation changes and detect construction activities by analyzing spectral indices and temporal trends. It was validated in Hallein and Vienna, showing moderate success but limitations in detecting small-scale changes or non-construction-related vegetation loss. The Built-up Checker utilized Sentinel-1 SAR data and machine learning to monitor urban development and classify parcels as built-up or non-built. It achieved good accuracy in detecting construction events on a quarterly basis. Additionally, a Random Forest model was developed to estimate building heights, but its accuracy was insufficient for integration into ESG ratings.

The conducted SWOT analysis revealed strengths such as the high temporal resolution and all-weather capabilities of Sentinel-1, as well as the high-resolution optical data of Sentinel-2, which is ideal for vegetation monitoring. The combination of both datasets enhanced accuracy and reliability. However, weaknesses included geometric distortions in Sentinel-1 data and cloud cover limitations in Sentinel-2 imagery. Opportunities were identified in scaling the methodologies across Europe and integrating advanced data fusion techniques. Threats included potential data gaps due to satellite malfunctions and competition from higher-resolution remote sensing technologies like LiDAR.

The project also developed a conceptual ESG rating framework to assess the impact of ESG risks on property value. This framework integrated spatial ESG indicators at market, location, and property levels, focusing on financial materiality. The rating system was designed to evaluate risks such as climate impacts, energy efficiency, and land use changes. However, challenges remained in data availability and integrating ESG metrics into business processes.

Validation efforts were conducted in Hallein and Vienna using reference data and high-resolution imagery. In Hallein, the Green Impact Score and Built-up Checker were tested against manually interpreted construction events, showing moderate success but also identifying limitations in detecting certain types of changes. In Vienna, the lack of high-resolution reference imagery limited the validation process, but some alignment was observed between detected events and planning data.

The project concluded that while Copernicus data provides a strong foundation for ESG monitoring, its limitations in spatial resolution and data continuity must be addressed. Recommendations included refining algorithms, exploring advanced data fusion techniques, and continuously monitoring regulatory developments to ensure the methodologies remain relevant. Dissemination efforts included presentations at scientific conferences and workshops, as well as the preparation of publications to share the project’s findings. The project successfully laid the groundwork for a geospatial ESG rating system, with plans for further development and commercialization.

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Projektpartner

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