



**DEPARTMENT OF INTERNATIONAL AND
EUROPEAN ECONOMIC STUDIES**

ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

**ASSESSING THE SUSTAINABILITY OF LAND
USE CHANGES AND SDG 15 IN GREECE**

ANGELOS ALAMANOS

PHOEBE KOUNDOURI

Working Paper Series

25-16

January 2025

Assessing the sustainability of land use changes and SDG15 in Greece

Angelos Alamanos¹, Phoebe Koundouri^{2,3,4,5*}

¹ Independent Researcher, Berlin, Germany

² Sustainable Development Unit, Athena RC, Athens, Greece.

³ School of Economics and ReSEES Research Laboratory, Athens University of Economics and Business, Athens, Greece.

⁴ Department of Technology, Management and Economics, Denmark Technical University (DTU), Kongens Lyngby, Denmark.

⁵ UN Sustainable Development Solutions Network-Europe, Paris, France.

*Correspondence: Phoebe Koundouri. Email: pkoundouri@aueb.gr

Abstract

Greece features a diverse landscape with significant land cover changes over recent decades, impacting sustainability components such as biodiversity, climate stability, and ecosystem services. Monitoring and mapping these changes are essential for informed land management. This research utilizes freely available satellite data (Remote Sensing) and open-source tools (QGIS and Excel sheets) to assess key metrics, including land cover change, productivity, and soil carbon storage. We also link these metrics to estimate the Sustainable Development Goal (SDG) 15, and the indicator SDG15.3.1, considering the sustainable land use changes. The spatial synthesis of these metrics reveals areas of land improvement, stability, and degradation from 2010 to 2020, offering insights into Greece's land dynamics historically. Results highlight that most of the land remains in a stable state of "land sustainability," but certain regions require targeted interventions to address degradation. Notably, urban expansion and intensive agriculture drive localized declines in ecosystem quality, while forest management and conservation policies contribute to stability and improvement. The methodology emphasizes transparency and replicability, with publicly available code and results tailored for Greece's unique environmental and socio-economic context. By aligning national efforts with SDG targets, this work supports policies for balancing economic growth with ecological resilience, ensuring the sustainable use of terrestrial ecosystems, and enhancing the quality of life for present and future generations in Greece.

Keywords: Land cover change; Land Productivity; Soil Carbon Storage; SDG15; remote sensing; satellite imagery.

References:

- Alamanos, A. (2024). Exploring the Impact of Future Land Uses on Flood Risks and Ecosystem Services, With Limited Data: Coupling a Cellular Automata Markov (CAM) Model, With Hydraulic and Spatial Valuation Models. *Qeios*. <https://doi.org/10.32388/JJWWBD>
- Koundouri, P., Alamanos, A., Plataniotis, A., Stavridis, C., Perifanos, K., & Devves, S. (2024b). Assessing the sustainability of the European Green Deal and its interlinkages with the SDGs. *Npj Climate Action*, 3, Article 1.
- Koundouri, P., Alamanos, A., Devves, S., Landis, C. & Dellis, K. (2025). Innovations for Holistic and Sustainable Transitions. *Energies* 2024, 17(20): 5184. <https://doi.org/10.3390/en17205184>
- Koundouri, P. & Alamanos, A. (2022). Integrated Management of Water-Energy Systems for the Sustainable Agricultural Development under crises. Piraeus Bank Journal “Epi Gis”. Issue ‘Summer-Autumn 2022’. (solicited paper – in Greek). <https://www.piraeusbank.gr/el/agrotos/agrotika-nea-enimerosi/epi-gis#1>
- Koundouri, P., Alamanos, A. & Devves, S. (2025). Challenges and solutions for the energy sector. *Energia.gr* (solicited paper – in Greek). <https://www.energia.gr/article/225303/proklhseis-kai-lyseis-ston-tomea-ths-energeias>
- Alamanos, A. & Koundouri, P. (2024). Estimating the water requirements per sector in Europe. 5th IAHR Young Professionals Congress. Online, 27-29 November 2024.
- Koundouri, P., Alamanos, A. & Sachs, J. (2024). A Global Climate Hub to bridge science and society. 12th Annual International Conference on Sustainable Development (ICSD). Online, 19-20 September 2024. <https://ic-sd.org/2024-conference-agenda/>
- Koundouri, P., Alamanos, A., & Sachs, J. (2024). Innovating for Sustainability: The Global Climate Hub. DEOS Working Papers.
- Alamanos, A. (2024). A Global Climate Hub. *Nature Sustainability* 7, 375–376 (2024). <https://doi.org/10.1038/s41893-024-01289-8>
- Alamanos, A. & Garcia, J.A (2024). Optimization examples for water allocation, energy, carbon emissions and costs. *Encyclopedia* 2024 4, 295-312. <https://doi.org/10.3390/encyclopedia4010022>
- Alamanos, A. (2024). A Cellular Automata Markov (CAM) model for land use change prediction using GIS and Python. The 5th International Electronic Conference on Applied Sciences (ASEC), 2024. Online, 4–6 December 2024.