

ÚRAD VLÁDY
SLOVENSKEJ REPUBLIKY

PLÁN [OBNOVY]



Decarbonization and Responsible Business Practices for Sustainable Development

Room: BELLEVUE II

Time: Tuesday, 13:00 – 15:00

Chairpersons: Jana Kozáková, Ľubica Bartová

DECARB TRACK: Carbon footprint tracking as a sustainability tool/ 09I04-03-V02-00054

<https://decarb.uniag.sk/en/>





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Decarbonization in Scientific Discourse: A Systematic Review and Bibliometric Analysis

Jana Kozáková – Alexandra Filová

Background and Motivation

- Decarbonization has become a central concept in climate, policy, and economic debates.
- Since the Paris Agreement, scientific interest in decarbonization has grown rapidly.
- The concept has evolved from a mainly technical issue into a multidimensional field involving governance, justice, innovation, and industrial transformation.
- Despite this growth, decarbonization is often studied only as a sub-topic of climate mitigation or energy transition.

To examine decarbonization as an independent and interdisciplinary research field.

Research Aim and Questions

Aim:

- To analyse the evolution, structure, and thematic orientation of decarbonization research in scientific literature.

Research questions:

- How has decarbonization developed and grown in scientific literature?
- Which subject areas, institutions, and countries lead this research?
- What are the dominant themes and how are they clustered?
- Where are the main limitations, blind spots, and underexplored dimensions?

Data and Methodology

Data source:

- Web of Science Core Collection
- Search term: “decarbonization”
- 16,927 documents
- Period covered: 2006–2025
- Only English-language records included
- 2025 data are partial

Methods used:

- Systematic review
- Bibliometric analysis
- VOSviewer keyword co-occurrence mapping
- Longitudinal trend analysis
- Lexical comparison with Google Books Ngram Viewer

Analytical Procedure

Bibliometric analysis focused on:

- Publication trends over time
- Document types
- WoS subject categories
- Citation topics
- SDG linkages
- Leading journals, institutions, and countries

Keyword mapping in VOSviewer:

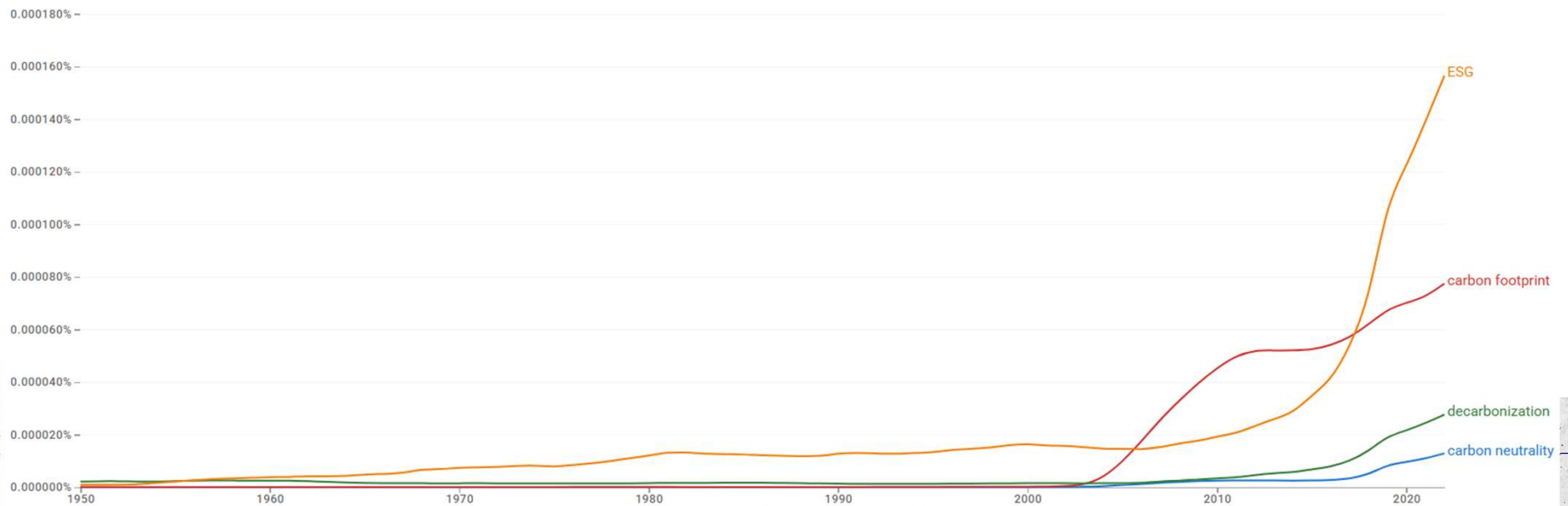
- Co-occurrence analysis
- All keywords
- Full counting method
- Minimum threshold: 100 occurrences
- 175 keywords analysed out of 43,179

Visual outputs:

- Network visualization
- Overlay visualization
- Density visualization

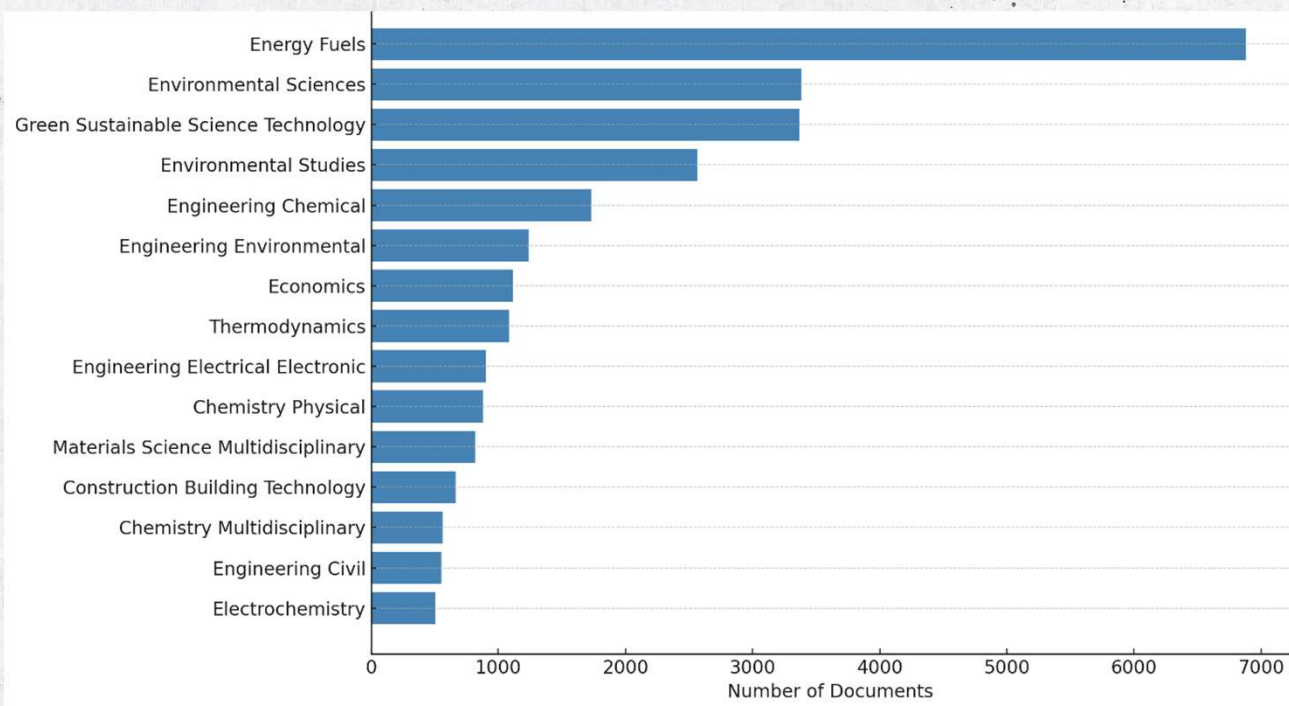
Growth of Decarbonization Research

- The topic of decarbonization shows **exponential growth after 2015**.
 - Publications increased from **16 documents in 2006** to **nearly 4,000 in 2024**.
 - This rise closely corresponds with major climate-policy milestones, especially the **Paris Agreement**.
 - The evidence suggests that decarbonization has moved from a niche topic to a mainstream interdisciplinary field.
- Research growth reflects stronger global attention to net-zero transitions and systemic climate action.



Main Disciplinary and Thematic Areas

Leading WoS subject categories:



Top citation topics:

- Sustainability Science
- Power Systems & Electric Vehicles
- Thermodynamics
- Catalysts
- Energy & Fuels
- Supply Chain & Logistics
- Management and Political Science

Decarbonization is both a technical and socio-economic transformation.

Geographic and Institutional Leadership

Leading countries/regions:

- United States
- China
- United Kingdom

Strong European contribution from:

- Germany
- Italy
- Spain
- France
- Netherlands

Leading institutions include:

- U.S. Department of Energy
- NREL (National Renewable Energy Laboratory)
- Lawrence Berkeley National Laboratory
- Imperial College London
- University College London
- Tsinghua University
- Chinese Academy of Sciences
- MIT, Stanford, Oxford, Cambridge, ETH Zurich

Research is globally distributed, but concentrated in high-capacity countries with strong research infrastructure.

Conclusions and Implications

Conclusions:

- Decarbonization is a rapidly maturing interdisciplinary research field.
- Energy systems, environmental sciences, and sustainability studies form its main foundation.
- New themes such as hydrogen, carbon capture, and justice-oriented governance show broadening scope.
- Policy-oriented themes receive stronger citation attention than implementation-focused technical themes.

Limitations:

- Only Web of Science Core Collection was used
- English-only dataset
- Underrepresentation of Global South and grey literature

Recommendations for future research:

- Expand database coverage
- Include policy and grey literature
- Deepen semantic and lexical analysis
- Strengthen links between technical and governance-oriented research



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Thank you for your attention!

Slovak University of Agriculture^{1, 2}
Faculty of Economics and Management
Institute of Economic Policy and Finance
Tr. A. Hlinku 2, 949 76 Nitra
Nitra, Slovakia
e-mail: jana.kozakova@uniag.sk