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The Degrowth Imaginary: A Bibliometric Analysis of the Literature

Küçülme Tahayyülü: Literatürün Bibliyometrik Analizi

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ABSTRACT

Alternative socio-political imaginaries stress the need to address ecological breakdown. Having received growing attention from scholars, research on degrowth as a burgeoning topic is scattered across various scientific disciplines such as environmental science, sociology, economics, and geography. However, the growing number of publications focusing on bibliometric analysis enable researchers to take a snapshot of the evolutionary account of a specific field. This article aims to present the state-of-the-art scientific knowledge on the degrowth imaginary by employing the tools of bibliometric analysis. It illustrates the evolving dynamics within degrowth research from 2008 to 2024. On the basis of 929 scientific publications retrieved from the Web of Science database, descriptive analysis determined the most active authors, institutions/organizations, journals, and countries in the literature. Bibliometric analysis, using VOSviewer, provided co-authorship analysis at the authors and country levels, co-occurrence analysis of keywords, and co-citation analysis of documents and authors in the field.

Anahtar Kavramlar: *Küçülme, Web of Science, Bibliyometrik Analiz, VOSviewer, Bilimsel Haritalama.*

ÖZET

Alternatif sosyo-politik tahayyüller, ekolojik parçalanmaya karşı çözüm ihtiyacını vurgulamaktadır. Giderek daha fazla ilgi gören bir konu olan küçülme üzerine yapılan araştırmalar, çevre bilimi, sosyoloji, ekonomi ve coğrafya gibi bilimsel disiplinlere dağılmış durumdadır. Diğer taraftan bibliyometrik analize odaklanan yayınların sayısının giderek artmasının nedenlerinden birisi de bu analizin araştırmacılara bir araştırma alanının geçirdiği gelişimsel sürecin anlık görüntüsünü sağlamasıdır. Bu çalışma, bibliyometrik analiz araçlarını kullanarak küçülme tahayyülüne ilişkin bilimsel literatürün son durumunu ele almayı amaçlamaktadır. Bu makale, 2008-2024 yılları arasında, küçülme literatürü üzerine olan çalışmaları analiz etmektedir. Çalışmada, Web of Science veri tabanından elde edilen 929 bilimsel yayın, betimsel analiz başlığın altında literatürdeki en etkili yazarlar, kurumlar, dergiler ve ülkeler belirlenmiştir. Ardından VOSviewer kullanılarak yapılan bibliyometrik analizle birlikte, ortak yazarlık analizi (co-authorship), birlikte bulunma (co-occurence), ve ortak alıntılanma (co-citation) analizleri gerçekleştirilmiştir.

Keywords: *Degrowth, Web of Science, Bibliometric analysis, VOSviewer, Science mapping*

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INTRODUCTION

Modern society is a constantly evolving metabolism in the midst of three immediate contradictions of the ecological overshoot, social shortfall, and capital accumulation (Fitzpatrick *et al.*, 2022). As a complex system of metabolism, contemporary society transforms raw materials into economic goods and waste in order to function properly (Farley & Voinov, 2016). Images of the rapidly growing economic activity, characterized by mega construction projects and the extensive resource use, have raised concerns about the long-term integrity of the environment. The detrimental consequences of the environmental breakdown are visible in the expected rise in material consumption to 90 billion tons by 2050 (Swilling *et al.*, 2018), in global population growth—a crucial driver in net consumption and waste production—as it is projected to reach 11 billion before the end of this century (Crist *et al.*, 2022), in the increasing levels of greenhouse gas emissions (Malhi *et al.*, 2020), in the accelerating rate of species leading to biodiversity loss, which is now 100 times higher (Ceballos *et al.*, 2015), and in exceeding nature's regenerative capacity (Rees, 2020; Wackernagel *et al.*, 2002).

The nature of environmental threats was perceived through apocalyptic scenarios of the future in public discourse during the 1960s and 1970s. However, this pessimistic tune witnessed a radical change and optimistic scenarios—where nature is thought to have a limitless carrying capacity for absorbing unsustainable resource use—gained dominance (Buell, 2004). In modern societies, the human-nature relationship is viewed in an instrumental way, prioritizing techno-managerial solutions over ecological transformation. Technological innovation is considered a savior in addressing environmental issues (Crist, 2019; Jesse & Swezey, 2010). Under the banners of green growth and ecological modernization, referred to as eco-modernist solutions (Grunwald, 2018), governments and businesses consider environmental problems through the lens of economics (Oels, 2005). Managerialism, adopting a performance-oriented outlook, designs environmental policies with rationality, efficiency, and utility (Luke, 1999).

The idea of pursuing technological development is closely associated with perpetual economic growth (Kerschner & Ehlers, 2016). For instance, the unlimited potential of economic growth has been promoted in addressing societal problems as technological progress is believed to neutralize any harm to the environment in the production process. However, recent decades have witnessed the growing disillusionment with the devolution of environmental issues into techno-managerial solutions. Post-development, steady-state, post-growth, and degrowth positions recognize the negative consequences of the current growth paradigm and promote alternative understanding of the human-nature relationship (Fioramonti, 2024; Gerber & Raina, 2018; Hollender, 2018). These perspectives challenge the implications of eco-modernist positions of techno-optimism and managerialism (Grunwald, 2018).

Degrowth is a complex term encompassing a radical slogan, an ideology, and a social movement (Demaria *et al.*, 2013; Hickel, 2021; Muraca, 2013). Originating in French politics, the term gained prominence in advocating for a radical transformation of society towards ecological harmony. Defining capitalism as a growth machine (Clark, 2024), the degrowth imaginary calls for building coalitions among different actors of environmental justice movements (Akbulut *et al.*, 2019). A variety of issues have been addressed in the degrowth literature such as: race and gender systems in ecological transformation (Paulson, 2024; Walk, 2024), housing development (Savini,

2023; J. Vandeventer *et al*., 2024; Xue, 2015), sustainable cities and urban transformation (Béal *et al.*, 2019; Buhnik, 2017; Lehtinen, 2018), timebanking (McGuirk, 2017), tourism (Renkert, 2019; Sard & Valle, 2024), business and corporate management (Wells, 2018; Wiefek & Heinitz, 2018). The point of departure of this paper is the observation that degrowth is a vibrant field of research where emerging ramifications can be seen in the wide array of conceptual applications of the term. The widespread application of degrowth leaves researchers in a challenging position for tracking the intellectual trend in the field.

Several scientific publications have reviewed the degrowth literature. These studies include: the impact of degrowth in the Global South (Gerber & Raina, 2018), a mixed-method study employing multivariate statistics (Engler *et al.*, 2024, p. 4), examinations of degrowth policy proposals (Cosme *et al.*, 2017; Fitzpatrick *et al.*, 2022; Schneider *et al.*, 2010), an analysis of contributions from different disciplines (Kallis *et al.*, 2018), and a review of scientific articles between 2006 and 2015 in the Scopus database (Weiss & Cattaneo, 2017), and bibliometric analysis of co-citation networks of the field between 2008-2016 as a proxy for multi-level perspective (Vandeventer *et al.*, 2019). Although these studies provide a general overview of degrowth, no scientific research deploying bibliometric analysis as a main concern has been found. The main research objective of this study is to examine the general outlook of the degrowth literature using performance analysis and science mapping techniques in bibliometrics through VOSviewer. The chief contribution of this paper will be the classification and visualization of networks among published scientific material in the degrowth literature between 2008-2024.

1. METHOD

1.1. Study Design

The volume and density of scientific knowledge production have been increasing recently. This trend is evident in the increasing scholarly attention to secondary research. The acceleration of scholarly production makes the literature review method critical (Snyder, 2019). In this context, literature reviews are crucial for revealing the status of a research field, its evolution, and existing knowledge gaps. Literature reviews are broadly defined as systematic processes for collecting and synthesizing earlier scientific knowledge. Two traditional methods for analyzing earlier findings of the literature are qualitative literature reviews and quantitative meta-analysis (Schmidt, 2008). A third line of research area is forming around quantitative bibliometric analysis (or scientometrics) (Zupic & Čater, 2015).

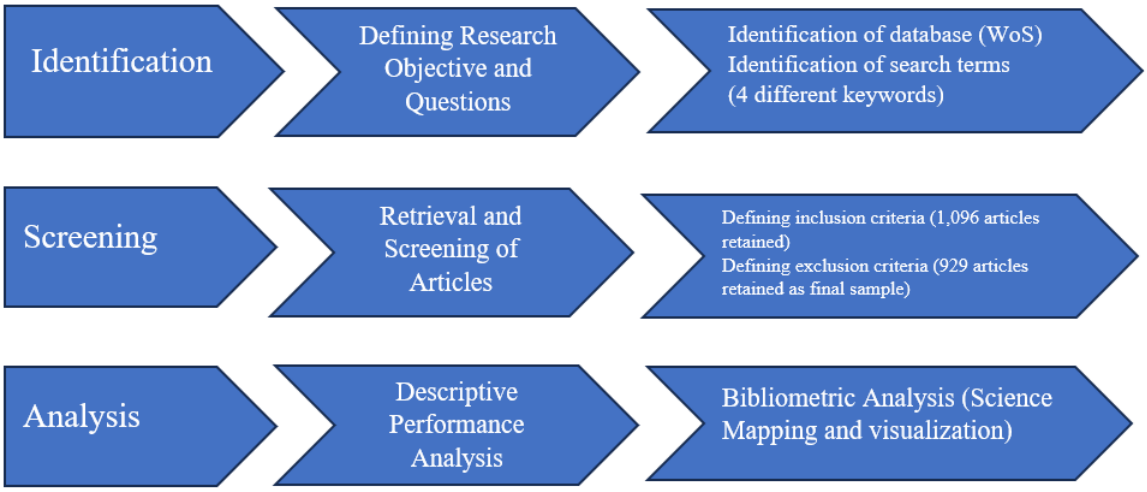
Studying the past mobilizes future research. Analyzing earlier scientific literature has three key advantages (Webster & Watson, 2002). It supports theory development, steers researchers away from oversaturated topics, and identifies novel research areas. Bibliometric analysis complements traditional literature review methods for analyzing the body of literature. However, bibliometric analysis enables researchers to manage all the literature related to any research topic (Öztürk *et al.*, 2024). In traditional reviews, managing large datasets of a research field is practically impossible, and there is always potential for the loss of significant key publications (Ramos-Rodríguez & Ruíz-Navarro, 2004).

Bibliometric analysis involves the examination of metadata of authors, articles, and other information retrieved from scientific databases. Key characteristics of bibliometric analysis include

categorizing the items and visualization of the results. This method aligns with a macro-level approach and provides a structural overview of a research topic in comparison to other review methods (Öztürk, 2021). Overall, bibliometric analysis enables researchers to capture a snapshot of the dynamic and expansive nature of a large body of literature.

The growing popularity of bibliometric analysis underlines how to conduct a proper analysis. While this debate leads to variability, four key phases for a bibliometric study are identified. Among them, determining the research questions is arguably most important part. There is a fine balance between the research questions generated from the research aim and the quality of the study (Öztürk *et al.*, 2024). This study incorporates two important techniques within bibliometric analysis namely performance analysis and science mapping.

Figure 1. Strategy and steps for bibliometric analysis of the degrowth literature on the Web of Science database



Research questions designed for this study are: (1) What are the most influential authors, papers, and journals in the degrowth literature? (2) What are the most active institutions and countries in the degrowth literature? (3) What is the trend in the number of publications over the years? (4) How is the degrowth literature distributed according to the Web of Science categories? (5) What are the most influential publications in the degrowth literature? (6) What are the interactions among scholars and countries in the degrowth literature? (7) What are the most frequently used keywords in the field and how they change over time? (8) What are the publications that are most cited together in the field? (9) What are the authors who are most cited together in the field?

Based on the sampling process of the relevant database, this study has several limitations: (1) it relies only on the Web of Science Core Collection for the literature review and retrieval of relevant publications, and (2) after applying the exclusion and inclusion criteria, non-relevant 167 articles were removed from the initial 1,096 results and leaving 929 scientific articles for bibliometric analysis.

1.2. Database and data collection

Any bibliometric study rests on analyzing collected documents from specified database. In this study, Web of Science Core Collection (WoS) database was decided to retrieve the relevant literature on degrowth (and post-growth). The WoS database is one of the most extensive scientific databases for scientific research. Today, it nearly consists of 34,000 scholarly journals and over 75 million records. Its content is constantly changing due to mergers such as incorporation of specialized databases as well as deletions from the Core Collection (Birkle *et al.*, 2020). It is argued the WoS database has stronger coverage in terms of scientific manuscripts than other databases (Chadegani *et al.*, 2013). It offers alternative formats for analyzing and exporting the conducted search. Also, filtering through micro- and meso-topics allows researchers navigate their search inquiries to the relevant documents.

In addition to selecting an appropriate database, designing an effective search inquiry forms another challenge for bibliometric studies (Sweileh, 2020). A valid search inquiry aims to reach maximum number of relevant documents while filtering out irrelevant ones. Due to the essential characteristic of bibliometric studies, researchers are required to work on an extensive number of scientific documents. The exponentially growing proliferation of the degrowth concept in academic literature has created confusions around the concept. Post-growth, agrowth, degrowth are used interchangeably (Jackson *et al.*, 2019). Following two systematic reviews on the degrowth literature (Engler *et al*., 2024; Fitzpatrick *et al.*, 2022), the researcher used "degrowth", "de-growth", "postgrowth", and "post-growth" keywords on topic search in title, keywords, and abstracts in the WoS database to retrieve all documents that are possibly related to the degrowth literature. Also, the timeframe for search was determined by the historical context of degrowth. The history of degrowth is contextualized in four phases. The last phase of degrowth, beginning in 2008, is referred to as 'the rebirth' (Parrique, 2019). The increasing number of publications correlates with growing reputation of the term since its rebirth. Therefore, the search was refined to the years between 2008-2024, language as English, and the document type was restricted to peer-reviewed journal articles. Books, book reviews, conference proceedings were excluded from the search. No relevant document that incorporates degrowth (post-growth) understanding was found prior to 2008. The WoS indexes for this inquiry were limited to Social Sciences Citation Index (SSCI), Science Citation Index Expanded (SCI-EXPANDED), Emerging Sources Citation Index (ESCI), and Arts & Humanities Citation Index (A&HCI). To ensure a valid search, the research areas limited to environmental studies, economics, and social sciences in general. Research areas that are related to natural sciences, such as marine biology, microfluids, and engineering, were excluded through filtering. The search yielded 1096 results. Database search and exporting documents were completed on a single day, July 24, 2024.

After retrieving relevant documents, Zotero software was deployed. The software is among several programs that enable users create, edit, and manage bibliographical information of documents. Zotero proved itself with the lowest number of mistakes in creating and editing bibliographical references (Kratochvíl, 2017). Through the software, all the abstracts of the retrieved documents were screened. Duplicated and irrelevant items were removed. Scientific publications that treat the degrowth imaginary only superficial and not consider it in detail were excluded from the analysis. The process led to the initial sample of 929 scientific documents. For

science mapping and visualization of networks, VOSviewer was used. The ecosystem of VOSviewer enables researchers to identify and visualize networks in a scholarly field. Compared to other bibliometric tools, VOSviewer is leading for its focus on visualization (Van Eck & Waltman, 2010).

2. RESULTS AND DISCUSSION

2.1. Descriptive Performance Analysis

As a typical empirical paper sets out descriptive statics before detailed examination, bibliometric research follows the same route (Cobo *et al.*, 2011). In descriptive analysis, key metadata elements of an article—such as researchers, authors, institutions, journals—are analyzed based on their performance in terms of publication and citation (Öztürk & Dil, 2022). Descriptive analysis provides crucial insights for mapping the literature's structure at any given moment. Table 1 summarizes the descriptive analysis of the sample.

Table 1. Descriptive Statistics of the Selected Database

Criteria	Quantity
Scientific Articles	929
Authors	1467
Scientific Journals	319
Institutions	816
Countries	69
Cited Reference	46891

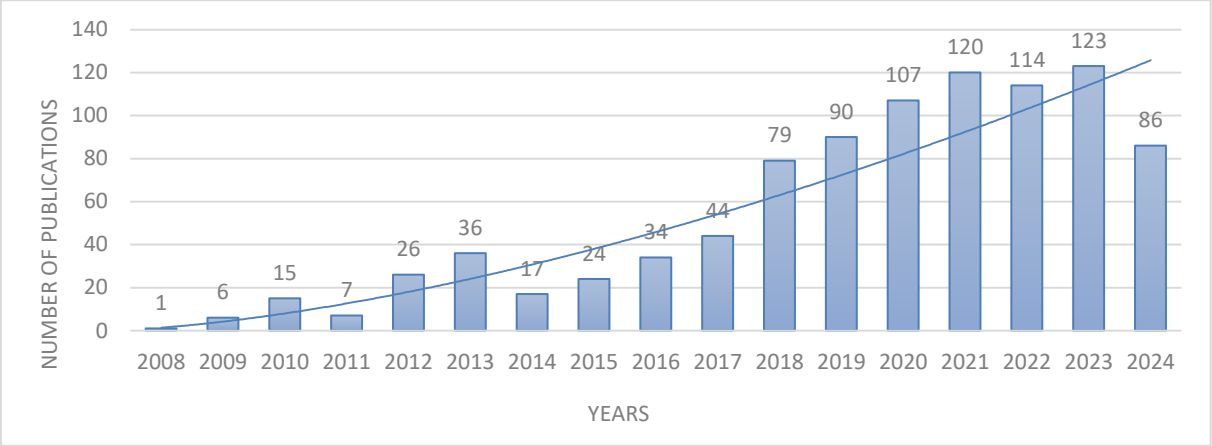
Table 2 shows the first 15 Web of Science categories in the degrowth literature. The top three categories are environmental studies, environmental sciences, and green sustainable science technology. Of the relevant data, 358 studies fall under environmental studies, while 338 studies belong to the environmental sciences category.

Table 2. Number of publications according to the Web of Science categories (First 15 categories)

Web of Science Categories	Number of Publications	% of Total Publications
Environmental Studies	358	38.53%
Environmental Sciences	338	36.38%
Green Sustainable Science Technology	235	25.29%
Economics	215	23.14%
Ecology	113	12.16%
Engineering Environmental	81	8.71%
Geography	75	8.07%
Regional Urban Planning	72	7.75%
Political Science	60	6.45%
Hospitality Leisure Sport Tourism	48	5.16%
Social Sciences Interdisciplinary	46	4.95%
Urban Studies	42	4.52%
International Relations	38	4.09%
Sociology	37	3.98%
Management	36	3.87%

The publication trend for the degrowth literature is illustrated in Figure 2. The first scientific article related to degrowth was published in 2008. The number of publications showed steady growth until 2013. Following a brief period of decline, the scope of degrowth in academia expanded consistently. Considered the six-year timeframe from 2008 to 2013, 91 articles were published. In comparison, the period from 2014 to 2019 produced 288 articles and represents a threefold increase in the number of publications. However, the trend after 2014 can be considered as 'second birth' of degrowth. More than three-quarters of the total number of publications, approximately %77.3, have been produced since 2018. The prediction curve in the figure suggests that scholarly publications on degrowth will likely continue to increase in the future.

Figure 2. Number of publications by year based on the Web of Science (between 2008-2024)



All scientific publications in the sample were produced in 69 different countries. Table 3 shows the top 10 active countries in the degrowth literature. These countries represent approximately 93.6% of the scientific publications in the initial sample. Spain, England, Germany, and the United States account for 57.1% of all scientific articles in the field. Spain leads in total citation (6921), citations per document (5569), and total link strength (1964) scores. France, where the degrowth imaginary spurred debate during its formation period, contributed 40 articles to the literature. The leading position of Spain in the degrowth literature, closely tied to the growing general interest in degrowth, can be attributed to the country's economic outlook, particularly after 2007. Gloomy economic indicators, such as high unemployment rates and income inequalities, combined with environmental issues like overpopulated cities, degradation of natural resources, and failures in urban planning, have contributed to this prominence. More specifically, the degrowth debate in Spain is vibrant, drawing insights from political parties such as Podemos, feminist economists, socio-political actors in autonomous regions, and local initiatives, all of which respond to the increasing pressure stemming from the multifaceted nature of economic and environmental crises. (Prieto & Domínguez-Serrano, 2017).

Table 3. Top 10 active countries

Countries	Publications	Citations	Citations Per Document	Total Link Strength
Spain	131	6921	52,8	2858
England	151	5569	36,9	1998
Germany	139	3558	25,6	1960
United States	110	2536	23,1	1146
Netherlands	66	2019	30,6	1029
Canada	48	1561	32,5	561
Sweden	77	1476	19,2	1030
Australia	54	1450	26,9	631
France	40	1001	25,0	463
Finland	54	969	17,9	617

Scientific publications in degrowth literature were distributed across 816 different institutions. Table 4 summarizes the top 10 active organizations/institutions based on the number of scientific documents, total number of citations, and frequency. These institutions are responsible for 247 scientific articles, which represent 23.8% of all scholarly work in the literature. The Autonomous University of Barcelona has the highest score in terms of number of documents (77), total citations (5375), and average citations per document (69.8). Comparing to Table 2, the Autonomous University of Barcelona and ICREA contribute to Spain's leadership among the most active countries in the literature. Out of 10761 citations, these two institutions are responsible for 6890 citations, which is approximately 64.0%.

Table 4. Top 10 active organizations/institutions

Organizations/Institutions	Documents	Citations	Frequency (% of Total Publications)
Autonomous University of Barcelona	77	5375	6,78
Lund University	33	752	3,55
University of Leeds	31	826	3,34
ICREA*	22	1515	2,37
University of Helsinki	21	444	2,26
Vrije Universiteit Amsterdam	15	681	1,61
The University of Melbourne	13	321	1,40
Miami University	13	223	1,40
Manchester Metropolitan University	11	321	1,18
Masaryk University	11	303	1,18

** Catalan Institution for Research and Advanced Studies*

The initial sample for the bibliometric analysis includes 929 articles published in 319 scientific journals. Table 5 summarizes the top 10 active journals in the degrowth literature. They account for approximately 42.1% of all publications. Nearly 27.2% of all publications were published in the Q1 journals. Approximately 11.3% of all scientific articles were published in Ecological Economics, with 105 articles. The journal has the highest number of citations, and it is the most productive journal in the list. Comparing impact factors (IF), which measures the quality of journals, the Journal of Cleaner Production has the highest score (IF: 9.7). The Journal of Sustainable Tourism ranks third in number of citations (1508) and second in impact factor scores (IF: 6.9). Also, the journal has the highest score in average citations per article with a score of 83.7. Comparing the 2023 Scopus citescore, the Journal of Sustainable Tourism has the highest score (21.1) and followed by the Journal of Cleaner Production (20.4)

Table 5. Top 10 active academic journals

Journal	Publication	Citations	Impact Factor	Citescore	Quartile	Frequency *(% of Total Publications)*
Ecological Economics	105	4819	6.6	12	Q1	11.3%
Journal of Cleaner Production	77	4017	9.7	20.4	Q1	8.3%
Sustainability	57	836	3.3	6.8	Q3	6.1%
Futures	34	1138	3.0	6.0	Q2	3.7%
Sustainability Science	25	375	5.1	11.3	Q2	2.7%
Journal of Political Ecology	22	366	2.0	4.1	Q3	2.4%
Environmental Values	22	798	2.2	4.6	Q1	2.4%
Journal of Sustainable Tourism	18	1508	6.9	23.1	Q1	1.9%
Globalizations	17	264	1.9	5.7	Q1	1.8%
Local Environment	14	194	2.4	4.1	Q1	1.5%

A total of 1,647 authors have contributed to emerging literature on degrowth between 2008 and 2024. As shown in Table 6, the top 15 active authors are responsible for 16.8% of all publications in the initial sample. Giorgos Kallis is the most active scholar, with 20 scientific articles, 3,011 total citations, a total link strength score of 272, and 150.5 average citations per article. In terms of total citations, Jason Hickel follows Giorgos Kallis with 1,243 citations. In total link strength scores, Hubert Buch-Hansen ranks second (TLS: 142). Considering the gender perspective, there are only 3 major female contributors in the list. This insight raises questions whether the degrowth is male-dominated field despite the ongoing fruitful discussions between degrowth and feminism (Abazeri, 2022; Walk, 2024).

Table 6. Top 15 active scholars

Author Name	Publications	Citations	Total Link Strength
Giorgos Kallis	20	3011	499
Max Koch	15	492	127
Jeroen C. J. M. van den Bergh	15	623	208
Ryan Gunderson	13	223	142
Jason Hickel	12	1243	134
Hubert Buch-Hansen	11	307	180
Stefan Drews	10	240	121
Brian Petersen	9	152	104
Benedikt Schmid	9	134	91
Filka Sekulova	9	693	198
Diana Stuart	9	152	104
Federico Demaria	8	671	161
Pasi Heikkurinen	8	124	64
Helen Kopnina	8	238	15
Daniel W. O'Neill	8	345	78

Table 7 summarizes the 10 most influential articles in the field. Most of the papers were written in the formative periods of the degrowth literature before its rebirth (2010-2014). The most cited article was published in the *Journal of Cleaner Production* and was written by Schneider et al. (2010). The paper, which has 582 total citations, discusses emerging literature on degrowth and

possible transformations to a society where degrowth replaces unsustainable growth patterns. More recent, the article by Jason Hickel and Giorgos Kallis (2020) represents the most influential article in the initial sample. Having 756 total citations, the article aims to debunk green growth theory with empirical evidence on carbon emissions. The third most cited article was written by Giorgos Kallis (2011). The paper, with 541 total citations, argues degrowth is not a term for economic shrinkage but a radical political project for an alternative society.

Table 7. Most influential articles in the degrowth literature

Ranking	Title	Authors	Total Citations
1	Is Green Growth Possible? (2020)	Jason Hickel; Giorgos Kallis	756
2	Crisis or opportunity? Economic degrowth for social equity and ecological sustainability: Introduction to this special issue (2010)	Francois Schneider; Giorgos Kallis; Joan Martinez-Alier	582
3	In defence of degrowth (2011)	Giorgos Kallis	541
4	What is Degrowth? From an Activist Slogan to a Social Movement (2013)	Federico Demaria; Francois Schneider; Filka Sekulova; Joan Martinez-Alier	402
5	Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm (2010)	Joan Martinez-Alier; Unai Pascual; Franck-Dominique Vivien; Edwin Zaccai	372
6	Sustainable consumption within a sustainable economy beyond green growth and green economies (2014)	Sylvia Lorek; Joachim H. Spangenberg	363
7	The economics of degrowth (2012)	Giorgos Kallis; Christian Kerschner; Joan Martinez-Alier,	324
8	Environment versus growth - A criticism of degrowth and a plea for a-growth (2011)	Jeroen C. J. M. van den Bergh	293
9	Degrowing tourism: rethinking tourism (2019)	Freya Higgins-Desbiolles; Sandro Carnicelli; Chris Krolikowski; Gayathri Wijesinghe; Karla Boluk	252
10	Diversifying and de-growing the circular economy: Radical social transformation in a resource-scarce world (2016)	Kersty Hobson; Nicholas Lynch	248

2.2. Science Mapping

As descriptive performance analysis maps out the shape of the literature at a given time, science mapping elaborates on the changing interactions and expanding dynamics of the literature. Scholars claim that simply conducting performance analysis of the relevant literature is not enough

for revealing ongoing dynamics. To analyze the vibrant and evolving character of a field, another feature of bibliometric analysis needs to be deployed. Science mapping is useful for revealing interactions among scientific units such as authors, institutions, and journals (Van Eck & Waltman, 2014). Unlike descriptive performance analysis, which provides a static picture of the field, science mapping offers researchers a moving picture where the formations of networks among scientific units are visible through visualization. Science mapping employs co-author, co-word, co-citation, and bibliometric coupling to reveal the formation of networks. These techniques can be deployed to achieve various aims within overall analysis such as examining intellectual, conceptual, and social structure of the field (Donthu et al., 2021; Öztürk et al., 2024).

Co-author analysis helps researchers examine the ongoing interactions in a research field according to the unit of analysis. The main goal for conducting co-author analysis is to reveal the social structure of the field. VOSviewer runs co-author analysis at the levels of authors, institutions, and countries. Figure 3 shows the geographical dispersion of the degrowth literature. In a cooperation network map based on countries as the unit of analysis, link thickness indicates the strength of collaboration between countries, while node size represents the number of scientific documents produced by each country. Connected clusters by lines show the degree that authors, institutions, and countries collaborate in scientific publications. The different colors between nodes establish collaboration clusters, which refers to close collaboration and interaction among countries. 8 main clusters are identified. England (151) and Germany (139) lead in the highest number of publications, while Spain (138) and England (123) are the leading countries in total link strength. Spain and the Netherlands (23), England and Spain (19) have the strongest link strength relationships.

Figure 4 presents the visualization of collaboration among the most active authors in the field. The colors represent different working groups among scholars. The size of nodes represents the number of documents. 15 main clusters are identified. Giorgos Kallis seems to have the most research networks in the field, since the author has interactions with five different research clusters.

Figure 3. The visualization of co-authorship network of the degrowth literature based on countries

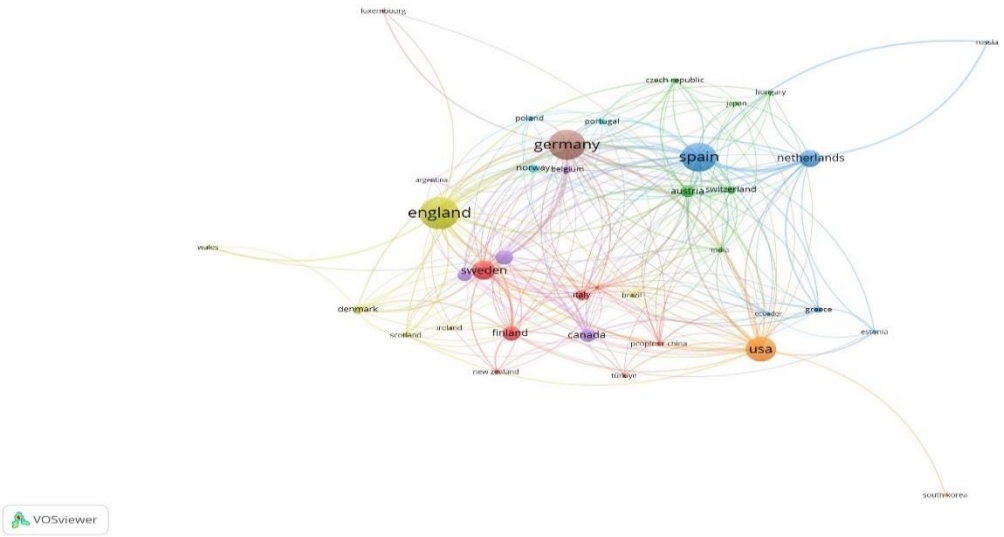
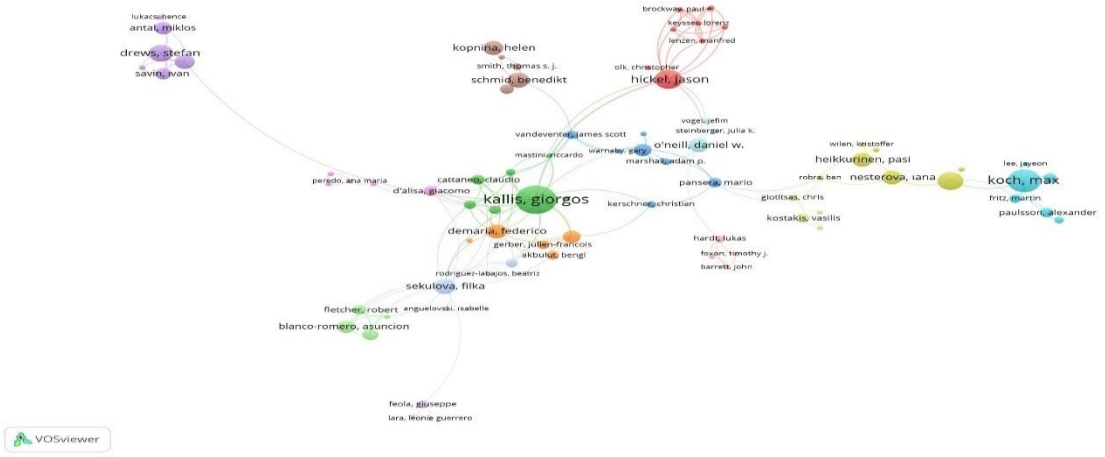
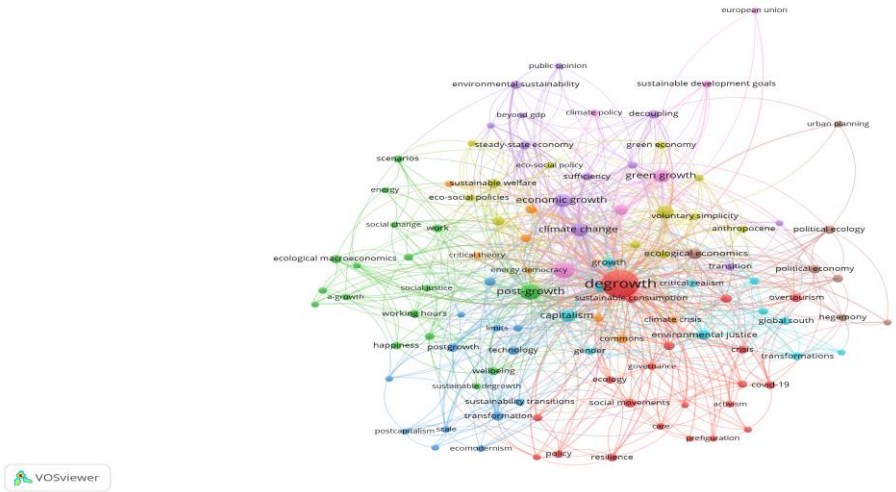


Figure 4. The visualization of co-authorship network in the degrowth literature based on authors



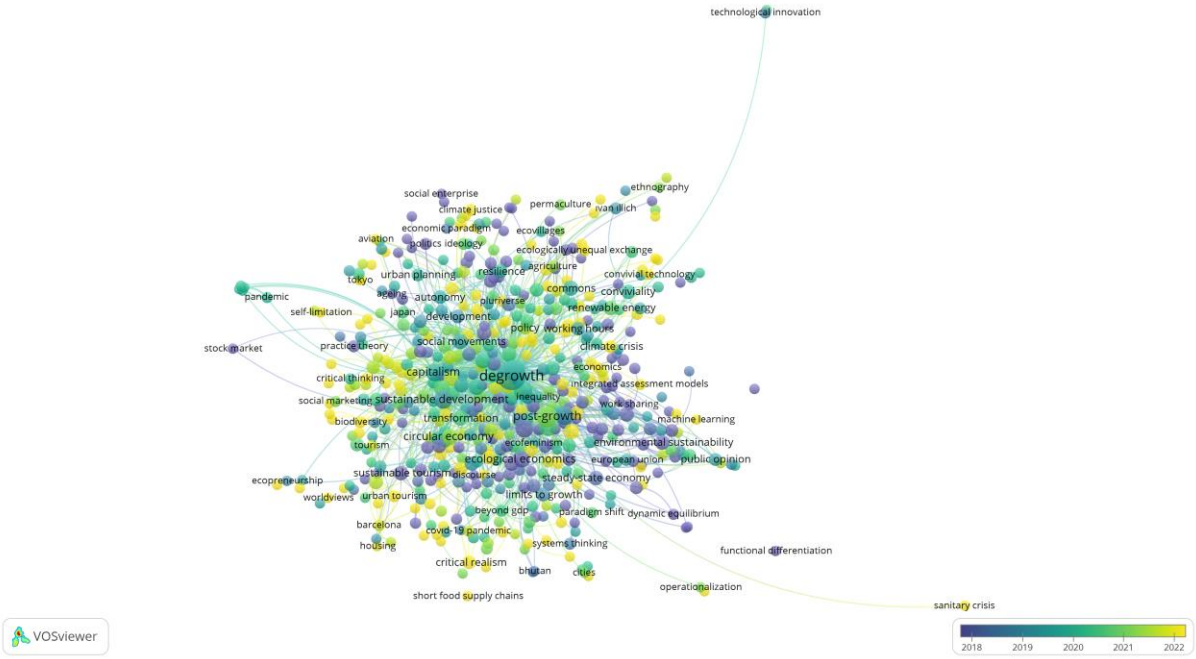
To reveal the conceptual structure, a co-occurrence analysis of keywords was conducted. The basic tenet of co-occurrence or co-word analysis is that similar clusters uncover underlying themes. There are 2,551 keywords are used in 929 scientific publications. Of total, 2,021 keywords are used only once. The minimum number of occurrences for a keyword was set to 5, producing 108 keywords. Figure 5 presents the network of keyword co-occurrence in the degrowth literature. The size of the nodes represents the level of interest in a word in the literature. Similar colors refer to close relationship between keywords. Nine clusters are identified based on keyword similarity. The overall theme of societal transformation is represented by post-growth, diverse and alternative economies, utopia, and post-capitalism. This strand of research exemplifies the transformative character of the concept. Climate change is one of the hot topics in the field. Studies examine the possible implementation of eco-social policies in governmental level to address climate change (Lidskog et al., 2020), while others focus on consumption (Moore, 2022) and simplicity (Borch, 2016). Circular economy is discussed alongside energy conviviality, technology (Meyers, 2024), and renewable energy (Ralph & Investigator, 2021).

Figure 5. The visualization of co-occurrence network of keywords in the degrowth literature



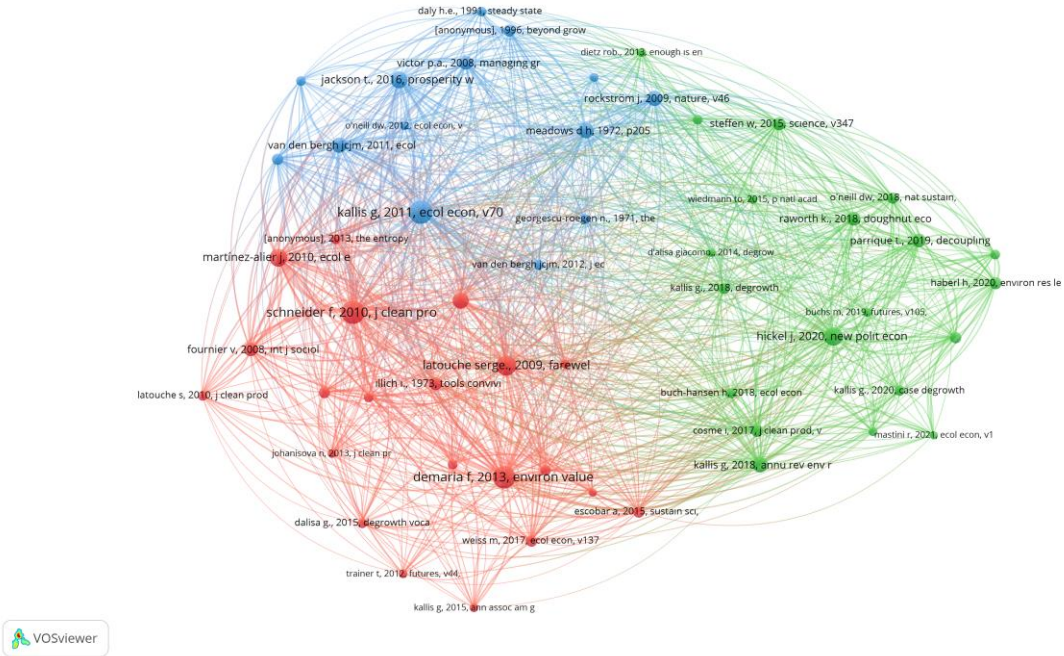
Also, co-occurrence analysis reveals the transformation of main keywords in the field over time. VOSviewer allows researchers to display overlay visualizations to track changes according to the unit of analysis. Figure 6 shows the evolution of keywords in the degrowth literature from 2018 and 2,022. The minimum number of occurrences of a keyword was set to 2. In result, a total of 530 out of 2,551 keywords meet the threshold. The changing color from dark blue to yellow represents the emerging keywords in the field. For instance, well-being, ecological economics, carbon targets, sufficiency, and sustainable tourism are keywords spotted in relatively old studies. More recent, blue economy, digital commons, machine learning, decoloniality, circular society, and critical realism are among prominent keywords. The analysis of keywords is crucial as it enables researchers to get glimpses of insights on research trends in the degrowth literature. For instance, the exploitative use of marine resources has gained popular attention over the years. Insights of degrowth under the umbrella of re-localizing production and collective ownership have started to establish a foothold in marine policies that are enmeshed in the neoliberal narrative (Hadjimichael, 2018). This development is important, opening new avenues in degrowth research. On the other hand, the degrowth imaginary is believed to be an enemy of the open society and an ally of anti-modern and anti-technology intellectual positions (Chambers, 2021; Strunz & Bartkowski, 2017). As degrowth researchers' recent interest in artificial intelligence (Meyers, 2024) and digital commons (Robra *et al.*, 2020) shows, there is the need for regulating technological developments and rescaling the level of energy output in a society for protection of the environment. By decoupling profit incentives from innovation and technological development, degrowth advocates for commons-based peer production, thereby presenting an alternative to the relentless pursuit of economic growth. The degrowth's spillover into novel areas shows the overall strength of the concept as a potential candidate for establishing an alternative society around new insights.

Figure 6. The overlay visualization of co-occurrence network of keywords in the degrowth literature



To examine the intellectual structure of the field, co-citation analysis was conducted. Every scientific paper includes a reference section. Co-citation analysis relies on citation networks to enable researchers to analyze the cognitive dimension of the field. The analysis can be performed at the levels of documents, authors, and journals. The results produce a co-citation network in which scientific units cluster based on their similarity. The outline of clusters in co-citation analysis enables researchers to identify thematic groups in the field, since it has been considered as important measure of thematic similarity (Small, 1973). Figure 7 shows the co-citation network based on documents. The minimum number of citations for a cited document is set to 40. The analysis produced three main clusters. The red cluster consists of 21 member references, while green and blue clusters have 20 and 14 member references, respectively. The red cluster includes articles about defining features of degrowth, radical transformation of society, and the critique of sustainable development. It consists of concepts such as conviviality, post-development, and pluriverse. The green cluster focuses on alternative ways of organizing the economy and the presence of planetary boundaries. Decoupling, green growth, green new deal, and affluence are key concepts in the green cluster. Finally, the blue cluster contains scientific publications that critique economic growth. The cluster includes entropy and state-state economy as important concepts.

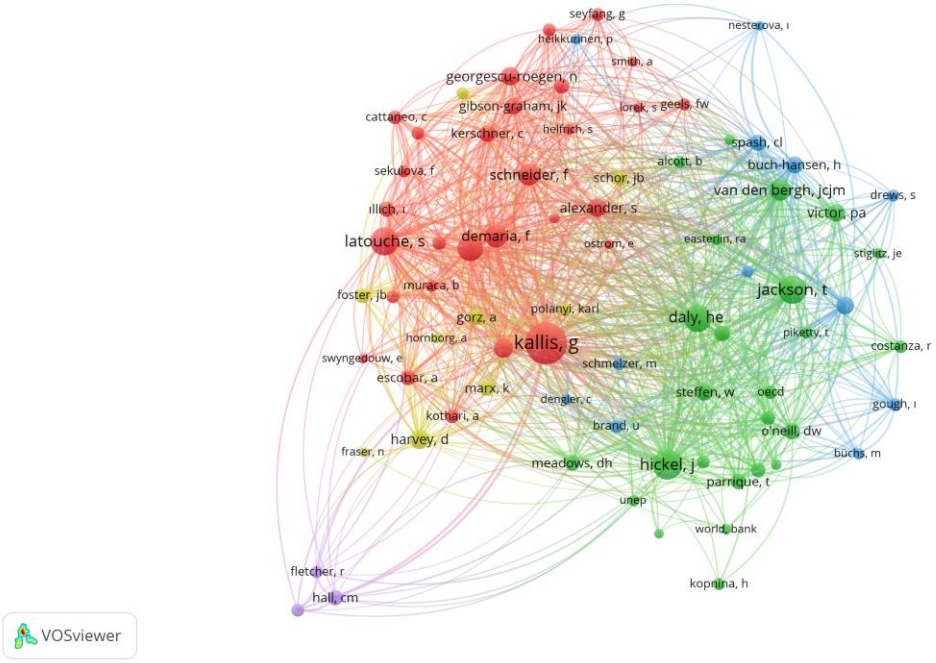
Figure 7. The visualization of co-citation network based on documents in the degrowth literature



Author co-citation analysis describes the most influential and contributing scholars in the field. The analysis groups the authors around same cluster if they have same research direction. The minimum number of citations of an author is set to 55. Figure 8, consists of 78 authors who meet the threshold, shows co-citation relationship in the field between 2008 and 2024. The analysis resulted in the formation of 6 clusters. The red cluster is the largest with 29 authors. The cluster

represents Kallis, Martinez-Alier, Latouche, D'Alisa, and Demaria as the core authors in the degrowth literature. Based on Table 6, this cluster is responsible for the production of most influential papers in the field. There are 25 authors in yellow cluster. Jackson, Hickel, Daly, and O'Neill are the most cited authors. The overall theme of this cluster is steady-state economy. The blue cluster includes 12 authors. The most cited authors in this cluster are Buch-Hansen, Koch, and Spash. The cluster examines the pre-conditions for structural change towards degrowth society. The yellow cluster contains 9 authors. The most co-cited authors are Foster, Gorz, Harvey, and Marx. The main theme of this cluster is that political economy approach to challenging common assumptions in economics. The purple is the smaller cluster. It consists of 3 authors namely: Fletcher, Hall, Higgins-Desbiolles. The authors mainly address the urgent need of rethinking tourism. As key component of capitalism, tourism carries implications of carbon society. Scholars argue degrowth brings ecologically sound tourism with limited human impact on the environment.

Figure 8. The visualization of co-citation network based on authors in the degrowth literature



CONCLUSION

This study employs the bibliometric analysis tools to map out the scholarly literature on degrowth between 2008-2024. Drawing insights from 929 scientific articles, this paper identifies the most influential authors, journals, institutions, and countries in the field. Two prominent techniques in bibliometric analysis, descriptive performance analysis and science mapping, shed light on the growing diffusion of degrowth as emerging research themes reveal. The co-occurrence, co-authorship, and co-citation analyses provide crucial insights for visualization of collaboration networks among leading research activity in the degrowth literature. The study contributes to the degrowth literature by identifying and examining emerging themes, which results from clusters.

However, there are some limitations of the study. The initial sample for this bibliometric analysis is limited to the Web of Science Core Collection. Establishing different inclusion/exclusion criteria, such as integrating other scientific databases, selections of different types of documents and languages can yield different results. Future studies can leverage combining these insights to reveal undetected research themes. Also, future studies can consider a gender analysis of research production in high-impact journals and the overall degrowth literature.

The insights of degrowth imaginary are crucial since it represents a novel candidate in establishing counterhegemony to the capitalist growth regime. Degrowth, as an umbrella concept, incorporates a wide array of intellectual schools of thought while drawing insights from different disciplines such as political science, ecological economics, and anthropology. By the same token, the degrowth imaginary strives to build bridges between various international and local social movements. Although these dynamics may present a complex landscape for researchers analyzing evolving trends in the literature, they also show that degrowth will be at the heart of the debates in the coming years over establishing an alternative socio-economic society. In sum, these findings establish a snapshot of current knowledge and evolving trends in degrowth. Classification of degrowth can establish valuable insights for policymakers and civil society actors alike. The degrowth imaginary has the potential to serve as a bridge where alternative socio-economic imaginaries can be better off by exchanging ideas.

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