

Where Has Degrowth's Centre of Gravity Moved? Mapping the Intellectual Evolution of Degrowth Research

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Abstract

Degrowth has become one of the fastest-growing fields of social research, yet its long-run intellectual evolution from early ecological-economic foundations to its contemporary research agenda has never been systematically mapped. Using a corpus of 2,780 peer-reviewed publications published between 1968 and 2025, we combine co-citation, co-word, and bibliographic coupling analyses to map the field's knowledge base, conceptual evolution, and emerging research front. Our analysis reveals that the intellectual centre of gravity of degrowth has shifted from articulating the theoretical foundations of degrowth toward empirically contesting green growth. The field's knowledge base is organised around three interconnected traditions—ecological economics, political ecology and post-development, and applied post-growth research paired with the critique of green growth—with the latter becoming the dominant intellectual hub in recent years. At the same time, the conceptual space of degrowth has expanded from a relatively concentrated critique of economic growth into a broad interdisciplinary research programme encompassing energy transitions, environmental justice, urban transformation, post-development, and alternative economic institutions. The emerging research front has likewise diversified toward post-growth macroeconomic modelling, decolonial perspectives, post-growth business, tourism, and sector-specific applications. By providing the first full bibliometric reconstruction of the field, this study offers a quantitative account of how degrowth has evolved and identifies promising directions for future research.

Keywords: Degrowth; ecological economics; sustainable development; political ecology; ecological macroeconomics; bibliometric analysis.

JEL Classification: B55, O44, P48, Q01, Q56, Q57

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1 Introduction

Over the past two decades, degrowth has evolved from a provocative slogan into a structured field of academic inquiry. Emerging from ecological economics and political ecology, and building on earlier critiques of indefinite economic expansion and the biophysical limits of growth (Georgescu-Roegen, 1971; Meadows et al., 1972; Daly, 1996), degrowth challenges the growth-centred economic model by advocating a democratically deliberated reduction in production and consumption, a more equitable distribution of resources, and a reorientation of social priorities toward well-being and ecological sustainability (Kallis, 2018; Hickel, 2020). The concept of degrowth has received attention from different disciplines such as sociology, geography, management, public planning, public policy, law, and philosophy, producing a large and increasingly diverse body of scholarship. This paper provides the first full bibliometric reconstruction of this evolving field.

The rapid expansion of this literature has transformed degrowth into one of the most dynamic areas of social research. Hundreds of new publications now appear each year, generating a body of scholarship that is increasingly large, interdisciplinary, and conceptually diverse. This growth has enriched the field, but it has also made its overall structure more difficult to apprehend. No individual researcher can easily reconstruct, through close reading alone, the intellectual foundations of degrowth, the relationships among its different theoretical traditions, or the evolution of its research themes over time. Important questions therefore remain difficult to answer using conventional approaches: Which publications constitute the intellectual foundations of degrowth? How have different traditions interacted and evolved? Which concepts have become central, which have declined in prominence, and which new themes are emerging? More broadly, where is the research frontier of degrowth scholarship moving?

These questions have become increasingly relevant as the field has matured and as a growing body of scholarship has sought to synthesise its development. Systematic reviews have examined degrowth as an emerging academic paradigm (Weiss and Cattaneo, 2017), synthesised its theoretical foundations and major debates (Kallis et al., 2018), and analysed the policy proposals associated with degrowth transformations (Cosme et al., 2017). More recent reviews have applied more systematic, larger-scale methods: clustering the literature along methodological and analytical dimensions (Engler et al., 2024) and using computational linguistics to identify its main topics (Hanaček et al., 2020), while a smaller-scale citation network analysis mapped relationships among 179 publications spanning 2008–2016 (Vandeventer et al., 2019). Together, these studies have substantially advanced our understanding of degrowth scholarship by clarifying its principal debates, concepts, and areas of application. Yet important questions remain about the field’s large-scale intellectual organisation and evolution. In particular, we still lack a comprehensive reconstruction of how the knowledge base has developed, how the conceptual vocabulary has evolved over time, and how new research fronts have emerged across the literature.

To address this gap, we examine four research questions. First, what publications and knowledge structures constitute the foundations of degrowth research? Second, what themes define the conceptual space of the field, and how has this space evolved over time? Third, which emerging areas characterize the contemporary research frontier of degrowth scholarship? Fourth, what gaps and future research directions become visible from the structure of the field itself? By answering these questions, we move beyond identifying influential publications or recurring topics to reconstruct the evolving architecture of degrowth as an interdisciplinary research field.

To answer these questions, we use bibliometric analysis, a family of quantitative methods designed

to identify structures and patterns within large bodies of scientific literature (Donthu et al., 2021). We construct a database of 2,780 peer-reviewed publications retrieved from OpenAlex, including complete metadata and reference lists. We combine performance analysis with three complementary science-mapping techniques: co-citation analysis to reconstruct the knowledge base and intellectual structure of degrowth research, co-word analysis to identify the conceptual space of the field and trace its evolution over time, and bibliographic coupling to detect emerging research fronts (Zupic and Čater, 2015). Together, these approaches provide a comprehensive reconstruction of both the historical foundations of degrowth scholarship and its recent transformation.

Our findings reveal that degrowth scholarship has undergone a profound intellectual reconfiguration rather than a simple expansion in publication volume. First, the field's knowledge base is organised around three enduring co-citation traditions: the foundational articulation of degrowth and its ecological-economic underpinnings, political ecology and post-development thought, and applied post-growth research paired with the critique of green growth.¹ These traditions provide the intellectual foundations upon which the field has developed, but their relative prominence has changed substantially over time. The early literature was anchored in ecological economics, biophysical limits, and critiques of growth, whereas more recent scholarship has increasingly concentrated on empirically assessing the compatibility between economic growth, ecological constraints, and sustainability transitions, alongside a growing effort to operationalise post-growth alternatives in policy and practice. This applied strand, initially absent from the field's intellectual structure, has emerged as the dominant contemporary cluster, signalling a shift in the centre of gravity of degrowth research from defining the limits of growth toward evaluating the feasibility of growth-compatible sustainability pathways.

Second, our analysis shows that this intellectual transformation has been accompanied by a broad expansion of the field's conceptual and empirical scope. The term degrowth, as captured by our keyword-defined corpus, evolved from a marginal concept associated primarily with biology before 2000 into a mature interdisciplinary discourse spanning climate and energy, justice, urban transformation, innovation, post-development, and alternative economic institutions. At the same time, the emerging research frontier has become increasingly differentiated. Recent scholarship no longer focuses exclusively on articulating critiques of growth but increasingly engages with their practical implications through post-growth macroeconomic modelling, provisioning systems, post-growth business, energy transitions, tourism, and decolonial perspectives.

Taken together, these findings show that degrowth has evolved along three interconnected dimensions: from conceptual consolidation toward thematic diversification, from foundational critique toward empirical and policy-oriented engagement, and from a predominantly European intellectual tradition toward a more globally engaged and decolonially attentive research programme.

Related Literature. This paper contributes to existing degrowth scholarship in three main ways. First, it provides the first full bibliometric reconstruction of the intellectual structure of the field. Existing scholarship has advanced understanding of degrowth through conceptual syntheses, systematic reviews, and, more recently, citation-network analysis. Early systematic reviews documented the emergence of degrowth as an academic paradigm and synthesized its foundational debates (Weiss and Cattaneo,

¹ Green growth refers to the approach that seeks to reconcile continued economic growth with environmental sustainability by improving resource efficiency, reducing environmental impacts, and promoting technological innovation. It differs from degrowth in that it does not question the desirability of aggregate economic growth itself.

2017; Kallis et al., 2018; Cosme et al., 2017). Subsequent reviews applied more systematic, larger-scale methods: using computational linguistics to identify the field’s main topics (Hanaček et al., 2020) and clustering its literature along methodological and analytical dimensions (Engler et al., 2024). Vandeventer et al. (2019) provided an initial quantitative overview of the field through a citation network analysis of 179 publications spanning 2008–2016. Polewsky et al. (2023) used a computational, topic-modelling approach to compare degrowth and green-growth discourse, though within a narrower thematic scope than the field’s full intellectual history we reconstruct here. Our contribution builds on and extends this literature by analysing 2,780 peer-reviewed publications spanning 1968–2025 through three complementary science-mapping techniques—co-citation, co-word analysis, and bibliographic coupling—to reconstruct the field’s intellectual structure, conceptual evolution, and emerging research front. Because our corpus begins before the term’s contemporary usage emerged, rather than at 2008 as in Engler et al. (2024) and Vandeventer et al. (2019), it can trace the field’s full semantic history, including a pre-2000 biological register invisible to studies whose sampling windows start after degrowth’s socio-economic meaning had already taken hold.

Second, we uncover how the intellectual centre of gravity of degrowth research has shifted over time. Previous scholarship has traced the emergence of degrowth from ecological economics, biophysical limits, and critiques of growth-oriented development (Georgescu-Roegen, 1971; Meadows et al., 1972; Daly, 1996; Latouche, 2009). Our analysis extends this literature by showing how these foundational concerns have evolved within the expanding research programme. While ecological-economic critiques provided the initial intellectual foundation of degrowth, contemporary scholarship is increasingly organised around empirical examinations of green growth, decoupling, sustainability transitions, and the institutional challenges of alternative pathways (Kallis, 2011; Hickel and Kallis, 2020). Rather than simply identifying different strands of degrowth thought, we document their changing prominence and the field’s movement from articulating critiques of growth toward investigating post-growth transformations. By tracing how the knowledge base’s balance among these traditions shifted period by period, this view complements prior quantitative treatments of the field, which have typically offered a synchronic snapshot of the field as it now stands or examined a specific debate in depth.

Third, we identify the emerging research frontier and unresolved directions of degrowth scholarship. Existing reviews have highlighted the increasing diversity of the field and its expansion toward issues of justice, governance, policy, and socio-technical transitions (Kallis et al., 2018; Hanaček et al., 2020; Engler et al., 2024). Our bibliographic coupling analysis advances this discussion by systematically identifying the research niches gaining prominence, including post-growth macroeconomic modelling, decolonial perspectives, urban degrowth, energy transitions, tourism, and post-growth business. It also reveals areas that remain comparatively less developed, particularly questions related to governance, institutional change, political feasibility, and the distributive consequences of transition. By mapping both the expansion and remaining gaps of the field, our study provides a macro-level account of the past evolution, present structure, and future trajectory of degrowth research.

The remainder of the paper is organised as follows. Section 2 presents the bibliometric methodology and data, including the science-mapping techniques employed and the construction of the publication database. Section 3 reports the corpus’s performance analysis and the results of the co-citation, co-word, and bibliographic coupling analyses. Section 4 discusses the implications of these findings for the evolution of degrowth research and identifies directions for future inquiry. Section 5 concludes.

2 Bibliometric Network Analysis

Systematic and narrative reviews provide an in-depth, qualitative reading of a research field, but they typically cover only a limited number of studies (often a few dozen to a few hundred) and concentrate on narrow, discipline-specific questions (Snyder, 2019). They are therefore ill-suited to charting a field as large and dispersed as degrowth in its entirety. Bibliometric analysis is the complementary instrument for this task: with its macro focus, broad timespan, and capacity to handle thousands of documents at once, it yields a holistic, relational map of a research domain, revealing patterns of which even domain experts may be unaware (Donthu et al., 2021), rather than a selective picture of a single topic or theme.

Our approach combines a carefully assembled corpus with two complementary bibliometric traditions (Donthu et al., 2021; Zupic and Čater, 2015): performance analysis, which quantifies a field’s productivity and impact (publication output over time, leading outlets, productive authors, geographic distribution) without examining how its constituent works relate to one another; and science mapping, which reconstructs a field’s relational structure, the intellectual traditions it builds on, the conceptual vocabulary it uses, and the research fronts along which it is expanding. The two are complementary: performance analysis profiles how much a field has produced and where, while science mapping reveals how that output is intellectually organised.² Next, we describe the science-mapping techniques used to chart the field’s intellectual structure, and then detail how the degrowth corpus itself was drawn from OpenAlex.

2.1 Science Mapping

Science mapping examines the relationships among research constituents—documents, references, and terms—to reveal the intellectual and conceptual organisation of a scientific field (Donthu et al., 2021; Zupic and Čater, 2015). We employ three complementary techniques, each addressing a distinct research question: co-citation analysis reconstructs the field’s knowledge base and intellectual structure; co-word analysis maps its conceptual space and evolution over time; and bibliographic coupling identifies its recent developments and emerging research fronts.

All three techniques represent the literature as a network: nodes joined by weighted links. What changes from one technique to the next is the unit of analysis and the meaning of a link. In every case, nodes that link strongly and often gather into densely connected groups, or clusters, which we read as the field’s main research streams. The three techniques look at degrowth through three lenses: its foundations, its vocabulary, and its frontier.

Co-citation analysis looks at the works that degrowth publications cite. Two works are co-cited when a later document lists both in its reference list, and the more often two works appear together, the stronger we draw the link between them. Authors cite jointly the references they treat as part of the same intellectual tradition, so clusters of co-cited works expose the field’s knowledge base, the foundational texts it builds on. The 2,780 corpus documents together make some 81,000 citations to roughly 48,000 distinct works; mapping all of these would yield an unreadable network dominated by once-cited references, so we retain only the ninety most-cited, the field’s core intellectual foundations,³

²We report both in the Results, performance analysis first, to give a quantitative profile of the corpus before mapping its underlying structure.

³We retain the ninety most-cited references because, among the cutoffs we tested, ninety gives the clearest and most interpretable cluster structure; the supporting sensitivity analysis is reported in Section 3.3.

and link each pair by the number of corpus documents that cite both. The network is thus built from the citation behaviour of the entire corpus, even though the map itself shows only its most influential references. Formally, let A be the document–reference incidence matrix, with $A_{di} = 1$ when document d cites reference i and $A_{di} = 0$ otherwise. The co-citation weight between references i and j is the number of documents that cite both,

$$C_{ij} = \sum_d A_{di} A_{dj}, \quad C_{ii} \equiv 0, \quad (2.1)$$

and these weights C_{ij} define the links of the co-citation network.

Co-word analysis looks at the language of the publications themselves rather than at their references. Two terms co-occur when they appear in the same title or abstract, and we link frequently co-occurring terms more strongly; clusters of such terms map the field’s conceptual space, its leading themes. Letting A now denote the document–term incidence matrix, the weight between two terms is given by the same expression, $C_{ij} = \sum_d A_{di} A_{dj}$, the number of documents in which both occur. To follow how this space moved, we built a separate network for each of four periods (1968–2000, 2001–2010, 2011–2020, and 2021–2025).⁴ We extracted the terms from titles and abstracts: we lower-cased the text, removed stop-words and generic academic vocabulary (including the word *degrowth* itself and its hyphenated variant *de-growth*, which would otherwise swamp every map), and dropped very short tokens. For the two sparse early periods we used single words and two-word phrases; for the dense recent periods we used two-word phrases only, which name more specific concepts such as climate change or ecological economics. Within each period we kept the terms that occur at least a minimum number of times (three, four, twelve, and eighteen, respectively, as the volume of text grows).⁵

Bibliographic coupling links two documents when they share one or more references, and the more references they share, the stronger the link; with A the document–reference incidence matrix, the coupling weight between documents d and e is

$$B_{de} = \sum_i A_{di} A_{ei}, \quad B_{dd} \equiv 0. \quad (2.2)$$

Co-citation reflects the choices of citing authors and builds up slowly, since a work must be cited many times to enter the knowledge base; coupling is set the moment a paper is published, so it captures the field’s research front, groups of recent documents that draw on a common literature before they themselves are widely cited. We built two coupling networks, for 2011–2020 and 2021–2025. Older documents have had longer to gather citations, so we set a higher entry threshold for the first decade (at least thirty citations) than for the recent one (at least twelve), which leaves the two networks of comparable size (222 and 253 documents).

The path from a network to its clusters is the same for all three techniques. Write w_{ij} for a link weight (a C_{ij} or B_{de} above), $s_i = \sum_j w_{ij}$ for the strength of node i , and $m = \frac{1}{2} \sum_i s_i$ for the total link

⁴The periods follow decade boundaries from 2001 onward, both for comparability and because they track the field’s development: the emergence of degrowth as an academic paradigm during the 2000s, its consolidation through the 2010s, and its recent acceleration. The first period is left longer (1968–2000) because output was negligible before then (Figure 1a) and too sparse to subdivide; it captures the pre-degrowth era in which the term circulated mainly outside the social sciences.

⁵These thresholds are calibrated for legibility and rise with the volume of text in each period: a low cutoff (three or four occurrences) is needed in the sparse early periods to retain enough recurrent terms to form a network at all, whereas the dense recent periods require a higher cutoff (twelve, then eighteen) to filter out idiosyncratic vocabulary and keep the map interpretable.

weight. Raw counts reward frequent nodes simply for being frequent, so we gauge the relative strength of each link by its association strength (van Eck and Waltman, 2009),

$$a_{ij} = \frac{2m w_{ij}}{s_i s_j}, \quad (2.3)$$

which compares the observed weight between two nodes with the value their strengths would predict; this normalised strength also drives the network layout. We then partition each network with the Leiden algorithm (Traag et al., 2019), which assigns each node to a cluster g_i so as to maximise the modularity

$$Q = \frac{1}{2m} \sum_{i,j} \left(w_{ij} - \gamma \frac{s_i s_j}{2m} \right) \delta(g_i, g_j), \quad (2.4)$$

where $\delta(g_i, g_j) = 1$ when i and j lie in the same cluster and 0 otherwise. The resolution γ sets how finely the network is divided; for each network we scanned γ over a grid and located the community count at which the partition stabilises. This is not an arbitrary target: for the co-citation network, the community count at which the search settles is also the one that maximises modularity across the entire scanned grid. Modularity peaks at $\gamma = 1.0$ with three clusters ($Q = 0.116$), strictly above the best two-cluster solution found anywhere on the grid ($Q = 0.114$) and the best four-cluster solution ($Q = 0.114$) (Appendix A.2 reports the full sweep). We fixed the random seed for exact reproducibility. This choice does not drive the result: at the reported resolution, 48/50 tested seeds converge on the same cluster count, and the seed we report sits within that consensus, with modularity $Q = 0.1158$ (against a maximum of 0.1163 across all tested seeds) and a mean adjusted Rand index of 0.98 against the other forty-nine partitions.

Finally, we laid out each network with weighted multidimensional scaling, which places strongly linked nodes close together while imposing no constraint on the distance between weakly or unlinked nodes, and we gave within-cluster links extra weight so that clusters occupy distinct regions of the layout.⁶ Colour indicates cluster membership, and node size represents prominence: the number of corpus documents citing each reference for co-citation networks, the frequency of terms in the corpus for co-word networks, and total coupling strength for bibliographic-coupling networks. We label only the most prominent nodes in each cluster.⁷

2.2 Data Collection

We retrieved our bibliographic data from OpenAlex, an open and comprehensive scholarly database that indexes works across all disciplines and provides full reference lists for citation-based analyses. We use OpenAlex because, unlike the proprietary Web of Science and Scopus, it is freely and openly available, permitting fully reproducible bibliometric studies. In addition, recent benchmarking shows that, for publications indexed across all three databases, OpenAlex provides source-reference coverage

⁶Node coordinates are obtained by minimising, via SMACOF majorization, the weighted sum of squared distances between linked nodes, with near-zero weight placed on unlinked pairs; this is the same VOS-mapping technique used by the VOSviewer software (van Eck et al., 2010). Unlike a classic force-directed layout, it applies no repulsion between unconnected nodes, so clusters that share few or no links can end up well separated rather than being held together by a uniform repulsive force.

⁷For visualisation, node radii are scaled so that node area is proportional to prominence. Specifically, if p_i denotes node prominence, the displayed radius is $r_i = r_{\min} + (r_{\max} - r_{\min}) \sqrt{(p_i - p_{\min}) / (p_{\max} - p_{\min})}$, where $r_{\min}$ and $r_{\max}$ are the smallest and largest displayed node radii and $p_{\min}$ and $p_{\max}$ are the minimum and maximum prominence values in the network.

comparable to Web of Science and Scopus (Culbert et al., 2025), making it a reliable platform for citation-based analyses.

We queried the OpenAlex API in 2026 for all works matching the term *degrowth* or its hyphenated variant *de-growth* (4,367 and 592 records respectively), combined the two sets and removed 88 records returned by both, leaving 4,871 works. Because OpenAlex’s search can match a query term outside the title and abstract themselves (for instance in the full text, funder information, or a reference list), we then required the literal string *degrowth* or *de-growth* to actually appear in each record’s title or abstract, which dropped a further 558 records as search false matches and left 4,313 works. This screened set was then restricted to peer-reviewed scholarly document types (journal articles, reviews, books, and book chapters) published between 1968 and 2025, excluding records hosted on preprint servers, institutional repositories, and thesis collections (which are not peer-reviewed) and removing retracted and paratextual records, which together dropped 1,417 further records. Deduplicating the remainder by identifier, DOI, and title⁸ then yielded a final corpus of 2,780 documents spanning 1968–2025; Appendix A.1 reports the full retrieval-and-screening funnel. No language restriction was applied, so that the field’s substantial French, Spanish, and German literatures are represented. For each document we extracted the title, abstract, authorship and affiliation information, source, publication year, citation counts, and cited references.

3 Results

We first profile the corpus through performance analysis, then turn to science mapping to reconstruct the field’s intellectual structure.

3.1 Performance Analysis

We describe the corpus along several standard dimensions: its growth over time, disciplinary composition, leading outlets, most productive authors, and geographic distribution.

Figure 1a depicts the evolution of publication activity over the period 1968–2025. Before 2010, the number of documents remained negligible, indicating limited scholarly engagement with the topic during this phase. Output then climbs steadily, from around forty documents in 2011 to nearly two hundred by 2019, as the topic attracts growing interdisciplinary interest. Growth accelerates further in the most recent years (apart from a brief dip in 2022), rising to a peak of 489 documents in 2025. Overall, the trajectory shows a clear shift, from marginal attention to sustained, intensive research, the same steep rise that recent reviews of the field have charted (Kallis et al., 2018; Engler et al., 2024).

The composition of this literature is as revealing as its volume. Figure 1b presents the disciplinary distribution of degrowth publications as a share of the corpus. The Social Sciences account for the

⁸Like all large bibliographic databases, including proprietary alternatives, OpenAlex may contain duplicate records, making record consolidation a standard preprocessing step in bibliometric research. We removed exact and near-duplicate documents by identifier, DOI, normalised title, publication year, and first author, together with the few remaining records sharing identical full titles, eliminating 116 duplicate documents. For the co-citation and bibliographic-coupling analyses, we likewise merged duplicate reference records into a single canonical identifier, chosen as the variant with the most complete bibliographic metadata (typically also the most frequently cited), with every merge verified manually. This prevents citations from being fragmented across duplicate records and understating a work’s influence.

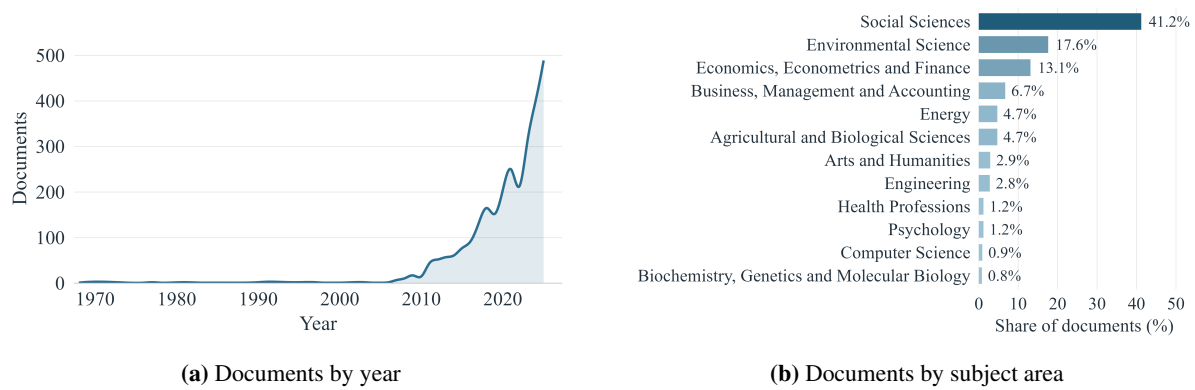


Figure 1: Growth and disciplinary composition of the corpus

Notes: Panel (a) plots the annual number of degrowth publications, 1968–2025 ($N=2,780$). Panel (b) shows the disciplinary distribution as a share of all 2,780 documents, based on each work’s primary field in the OpenAlex classification.

largest share at 41.2%, followed by Environmental Science at 17.6%. Economics, Econometrics and Finance contribute 13.1% and Business, Management and Accounting 6.7%, while Energy (4.7%) and the Agricultural and Biological Sciences (4.7%) follow closely. Arts and Humanities and Engineering contribute 2.9% and 2.8% respectively, with the remainder distributed across Earth and Planetary Sciences, Computer Science, and other fields. This distribution indicates that degrowth research is predominantly anchored in the Social Sciences and Environmental Science, the interdisciplinary breadth long stressed in stock-takings of the field (Weiss and Cattaneo, 2017). The strong presence of Economics and Business signals a sustained focus on policy and managerial dimensions, while contributions from Energy, Engineering, and the Agricultural and Biological Sciences highlight the technological, resource-oriented, and biophysical perspectives that the field integrates.

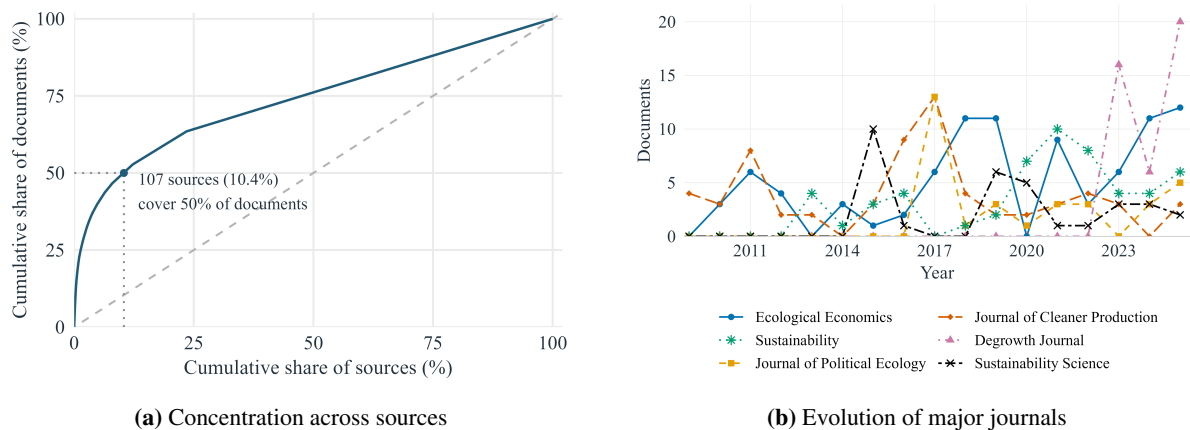


Figure 2: Where degrowth is published

Notes: Panel (a) plots the cumulative share of documents against the cumulative share of sources, ranked from most to least productive (a Lorenz curve); the dashed diagonal marks a perfectly even spread. Panel (b) plots the annual number of degrowth publications, 2008–2025, for the six most productive peer-reviewed journals (book series and preprint repositories excluded).

That interdisciplinary breadth is reflected in where degrowth research is published. Although *Ecological Economics* is the largest outlet, accounting for 3.2% of the corpus and reflecting the field’s roots in ecological economics (Martínez-Alier et al., 2010), publication is remarkably dispersed. The 2,780 documents are distributed across roughly 1,030 distinct sources, 76.5% of which publish only a single

degrowth paper. Figure 2a makes this dispersion explicit: the most productive 10% of sources account for only half of all publications, meaning that 107 different venues (10.4% of all sources) are needed to reach 50% of the corpus. Degrowth research is therefore not concentrated in a handful of flagship journals but diffuses across a wide range of disciplinary outlets, reflecting its strongly interdisciplinary character.

Even within this highly dispersed publication landscape, a small group of journals provides a recurring forum for the field. Figure 2b traces the annual output of the six most productive peer-reviewed journals—*Ecological Economics*, the *Journal of Cleaner Production*, *Sustainability*, the *Degrowth Journal*, *Journal of Political Ecology*, and the *Sustainability Science*—which together account for about 11.3% of the corpus (roughly one-sixth of all journal publications). *Ecological Economics* maintains a steady presence throughout the period, consistent with its role in publishing foundational contributions such as [Martínez-Alier et al. \(2010\)](#) and [Kallis \(2011\)](#). The *Journal of Cleaner Production* expands rapidly before peaking around 2017 and subsequently declining, whereas the most striking development is the emergence of the dedicated *Degrowth Journal*. Since its launch in 2023, it has become the field’s most active publication venue by 2025, signalling the growing institutional consolidation of degrowth as a distinct area of scholarship. The remaining journals contribute more intermittently, reflecting the continued diffusion of degrowth research across the broader sustainability literature.

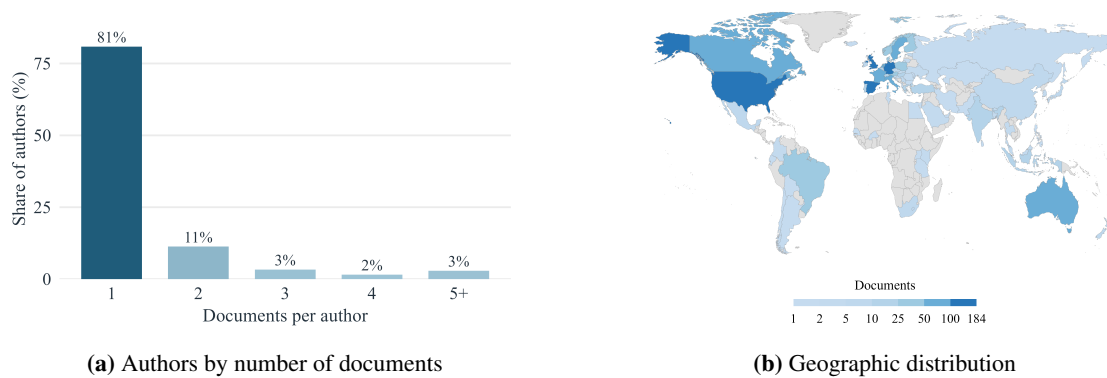


Figure 3: Authorship and geography of the corpus

Notes: Panel (a) shows the share of the 3,453 distinct authors by their number of degrowth papers (each author counted across all co-authored documents). Panel (b) maps the number of documents by corresponding-author country, shaded by graduated count classes; countries with zero degrowth documents in the corpus are shown in grey.

Authorship is similarly uneven. Figure 3a shows that the overwhelming majority of contributors engage with degrowth only once: 80.9% of the 3,453 distinct authors appear on a single paper, a further 11.3% on two, and 2.9% on five or more. The field thus rests on a small, recurring core of scholars surrounded by a broad, shifting periphery of occasional contributors, the mark of a young field, recently characterised by [Kallis et al. \(2018\)](#), that is still drawing in newcomers faster than it accumulates specialists.

The geographic distribution of the literature is similarly uneven. Figure 3b maps publications by corresponding-author country and reveals a pronounced concentration in Europe. United Kingdom leads with 184 publications, followed by Spain (149), United States (147), and Germany (128). A second tier of European countries, together with Australia and Canada, also contributes substantially, whereas output across much of the Global South remains comparatively limited.⁹ This pattern reflects

⁹This proxy captures the institutional location of researchers rather than the populations or places their scholarship exam-

the predominantly European origins of degrowth as an intellectual and political project (Demaria et al., 2013), while lending empirical support to recent calls for broader geographical representation within the field (Hanaček et al., 2020).

Taken together, these descriptive indicators portray a field that has expanded rapidly while undergoing institutional consolidation. Degrowth research is interdisciplinary in scope, widely dispersed across publication outlets despite the emergence of dedicated journals, and still geographically concentrated in Europe and North America. However, descriptive statistics alone cannot reveal how the field is intellectually organised. They do not identify the works that constitute its knowledge base, show how its conceptual vocabulary has evolved, or reveal the themes shaping its contemporary research frontier. Addressing these questions requires science-mapping techniques that reconstruct the relationships among publications, concepts, and citations.

3.2 Science-Mapping Results

Having profiled the corpus's performance, we now turn to its intellectual structure. The following analyses take up our first three research questions in turn: co-citation analysis recovers the field's knowledge base, co-word analysis maps its conceptual space and how it has evolved, and bibliographic coupling traces its emerging research front.

3.2.1 Intellectual Structure: Co-Citation Analysis

To investigate the intellectual structure of the degrowth literature, we performed a co-citation analysis of the references cited by the corpus. The underlying premise of co-citation analysis is that documents frequently cited in tandem are likely to share conceptual or methodological affinities and thus belong to the same research tradition or thematic domain. From the references cited across the corpus, the analysis retained the ninety most-cited as the nodes of the network, capturing the field's most influential contributions.¹⁰ The co-citation network was normalised using association strength and partitioned with the Leiden community-detection algorithm, which groups references by maximising internal co-citation strength.

Each resulting cluster represents a coherent body of literature, delineated by shared intellectual concerns and citation patterns. The network (Figure 4) resolves into three clusters, each corresponding to a major thematic orientation within the degrowth research landscape: the foundational articulation of degrowth and its ecological-economic underpinnings; political ecology and post-development thought; and applied post-growth research and the critique of green growth (Table 1 lists the most co-cited works in each cluster). Read together, these three clusters give empirical shape to the intellectual currents that earlier, narrative accounts of the field had distinguished only qualitatively (Demaria et al., 2013).

ines. This distinction is particularly important for the decolonial-degrowth research identified later in the coupling analysis (Section 3.2.3), where a European-based scholar studying degrowth in the Global South is classified here as European.

¹⁰Node labels in Figure 4 and the years in Table 1 report the publication year that OpenAlex records for each reference. Because variant records of the same work were merged onto a single canonical record (Section 2), and because OpenAlex sometimes dates a work by its online rather than its print appearance, a label may differ by a year from the work's commonly cited date; for instance, Hickel and Kallis's "Is Green Growth Possible?" is labelled 2019 in the figure but cited as 2020 in the text and reference list.

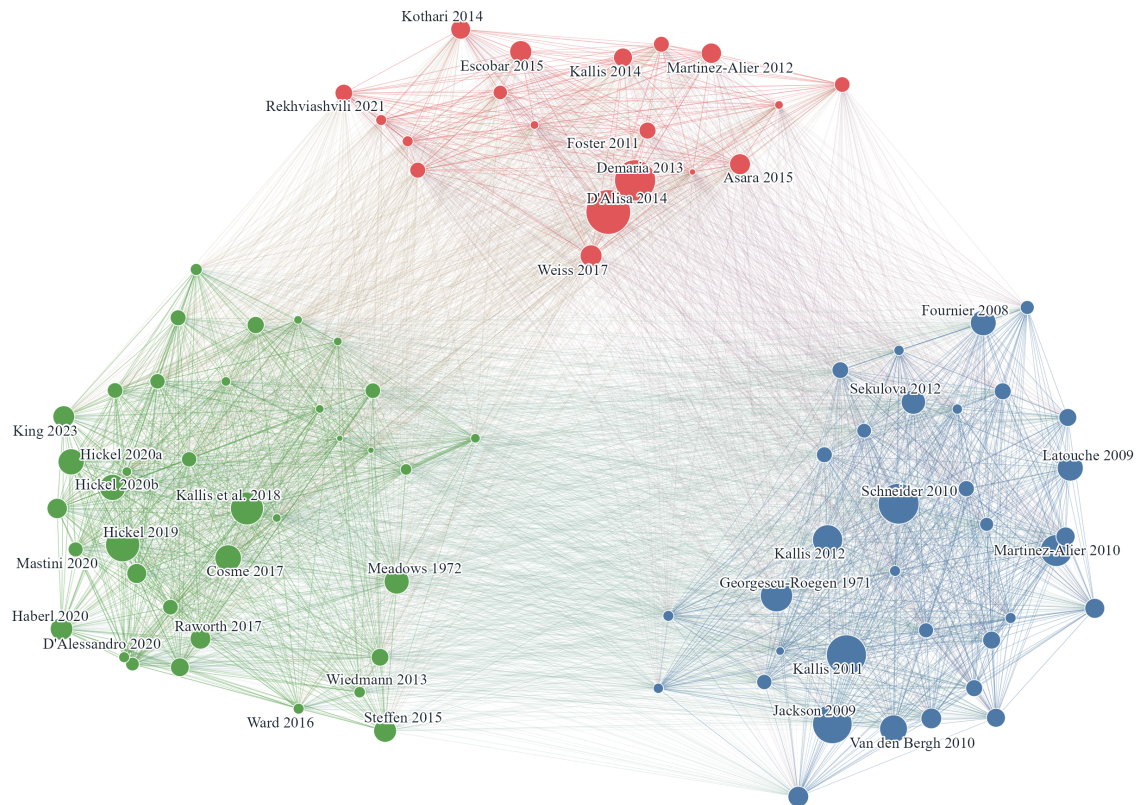


Figure 4: Co-citation network (1968–2025)

Notes: This figure displays the co-citation network of the ninety most co-cited references in the degrowth literature. Clusters are identified with the Leiden algorithm; node size is proportional to the number of corpus documents citing the reference.

Cluster 1: Foundations (Blue). This is the field’s foundational core, a broad and heterogeneous cluster merging the seminal articles that defined degrowth with the ecological-economic, biophysical, and steady-state classics on which they build and the early empirical work that put them into practice. Its most co-cited works are [Schneider et al. \(2010\)](#)’s framing of degrowth for ecological sustainability and social equity, [Kallis \(2011\)](#)’s “In Defence of Degrowth,” and [Jackson \(2009\)](#)’s *Prosperity Without Growth*, together with [Kallis et al. \(2012\)](#)’s statement of the economics of degrowth, [Georgescu-Roegen \(1971\)](#)’s entropic critique of the economic process, [Martínez-Alier et al. \(2010\)](#)’s mapping of degrowth within ecological economics, [van den Bergh \(2011\)](#)’s critical rejoinder proposing “a-growth” as an alternative to degrowth, and [Victor \(2008\)](#)’s *Managing Without Growth*. It also gathers the *décroissance* roots of the movement ([Fournier, 2008](#)), its early empirical and grassroots strand ([Sekulova et al., 2012](#); [Johanisova et al., 2012](#)), and the link to the political economy of inequality through [Piketty \(2014\)](#)’s *Capital in the Twenty-First Century*. The cluster articulates degrowth as a multidimensional critique of growth-centred economics anchored in ecological-economic and steady-state thought.

Cluster 2: Politics (Red). This cluster gathers texts rooted in political ecology, cultural critique, and post-development thought. Its most co-cited works are the vocabulary volume ([D’Alisa et al., 2014](#)) and [Demaria et al. \(2013\)](#)’s account of the origins and meanings of degrowth, followed by [Escobar](#)

Table 1: The knowledge base of degrowth: most co-cited references by cluster

Reference	Focus	Citations
<i>Cluster 1: Foundations (Blue)</i>		
Schneider et al. (2010)	Degrowth for sustainability and equity	256
Kallis (2011)	Case for degrowth as a political project	247
Jackson (2009)	Post-GDP macroeconomics	240
Georgescu-Roegen (1971)	Entropic critique of the economic process	160
Martínez-Alier et al. (2010)	Degrowth within ecological economics	157
Kallis et al. (2012)	Macroeconomics of non-growing economy	141
van den Bergh (2011)	Case for growth-agnostic “a-growth”	120
<i>Cluster 2: Politics (Red)</i>		
D’Alisa et al. (2014)	Glossary of core degrowth concepts	309
Demaria et al. (2013)	Origins and meanings of degrowth	260
Escobar (2015)	Post-development and transitions	81
Weiss and Cattaneo (2017)	Degrowth as an emerging paradigm	80
Asara et al. (2015)	Social-ecological transformation	74
Martínez-Alier (2012)	Environmental justice and degrowth	71
Kothari et al. (2014)	Alternatives to sustainable development	68
<i>Cluster 3: Applied post-growth research and the critique of green growth (Green)</i>		
Hickel and Kallis (2020)	Decoupling critique	179
Cosme et al. (2017)	Degrowth policy proposals	111
Hickel (2020)	Post-growth programme	108
Haberl et al. (2020)	Systematic review of decoupling evidence	84
Fitzpatrick et al. (2022)	Systematic mapping of degrowth policy	71
Ward et al. (2016)	Empirical test of decoupling feasibility	38
D’Alessandro et al. (2020)	Feasible policy alternatives to green growth	38

Notes: For Clusters 1–2 we list the seven most-cited works; ranking strictly by frequency would otherwise let the largest clusters crowd out the smallest. For Cluster 3 we list the most-cited work representing each of its principal sub-themes (empirical critique of green growth; applied/policy operationalisation of post-growth alternatives), since its most frequently cited works alone would not represent the cluster’s thematic range. “Citations” is the number of corpus documents citing the reference. Cluster colours match the network map.

(2015)’s post-development critique and [Weiss and Cattaneo \(2017\)](#)’s stock-taking of the field. It also includes [Asara et al. \(2015\)](#)’s account of degrowth as a social–ecological transformation, [Martínez-Alier \(2012\)](#)’s case for an alliance between the environmental-justice and degrowth movements, and [Kothari et al. \(2014\)](#)’s pairing of degrowth with *buen vivir* and ecological swaraj.

Cluster 3: Post-Growth and the Critique of Green Growth (Green). The most contemporary and fastest-growing cluster spans two related strands: an empirical critique of green growth and the applied operationalisation of post-growth alternatives. The critique strand is anchored by [Hickel and Kallis \(2020\)](#)’s “Is Green Growth Possible?”, alongside [Haberl et al. \(2020\)](#)’s systematic review of the evidence on decoupling and [Ward et al. \(2016\)](#)’s empirical test of whether GDP growth can be decoupled from environmental impact. The applied strand includes [Hickel \(2020\)](#)’s *Less Is More* and the systematic mappings of degrowth policy proposals by [Cosme et al. \(2017\)](#) and [Fitzpatrick et al. \(2022\)](#), while [D’Alessandro et al. \(2020\)](#)’s modelling of feasible policy alternatives to green growth bridges both strands directly. This cluster frames degrowth’s contemporary research front as an empirically grounded challenge to green-growth narratives, paired with a growing effort to translate post-growth ideas into concrete policy proposals.

Temporal Evolution of the Knowledge Base. The full-period co-citation network identifies the main intellectual traditions in degrowth research, but it does not show how their relative prominence has changed over time. To trace this evolution, we recompute the co-citation network separately for each period while holding the three clusters identified in the full-sample network fixed (Figure 5; Appendix A.3 describes the underlying method). The resulting pattern is clear. From 2001 onward, the foundational cluster dominates the knowledge base, accounting for 95.6% of co-citation mass in 2001–2010. Its share then falls steadily to 30.4% by 2021–2025. Over the same period, the applied post-growth and green-growth-critique cluster rises from a marginal 3.1% to 48.6%, becoming the largest intellectual centre in the most recent period.¹¹ The temporal shift is also reflected in within-cluster association strength: the green-growth-critique cluster has the highest mean internal association strength (1.53), followed by political ecology (1.48) and the foundational cluster (1.34).¹² Taken together, these patterns indicate a pronounced shift in the centre of gravity of the degrowth knowledge base, from foundational ecological and economic critiques toward applied post-growth research and engagement with green-growth debates.



Figure 5: Temporal evolution of the knowledge base: share of co-citation mass by cluster

Notes: This figure shows the three clusters' share of total co-citation node strength among the ninety fixed reference nodes, computed from documents published in the period only; shares sum to 100% up to rounding. Clusters and colours are fixed from the full-corpus map (Figure 4). Each bar draws on the period's corpus documents contributing at least one co-citation among the retained nodes: $N = 17$ for 2001–2010, $N = 84$ for 2011–2020, and $N = 90$ for 2021–2025; the 1968–2000 period is omitted (zero contributing documents).

¹¹The 2001–2010 estimate is based on only 17 documents, but these represent a relatively large share (30%) of the 56 degrowth papers published during that period. By contrast, the 2011–2020 and 2021–2025 estimates draw on substantially more documents (84 and 90, respectively), although these account for smaller shares of the much larger outputs in those periods (8% and 5%).

¹²Association strength normalises the raw co-citation count between two references by how often each is cited overall, so that two references linked mostly to each other score higher than two references that are simply cited very often in general (Section 2).

3.2.2 Conceptual Structure: Co-Word Analysis

This section presents a co-word analysis of the degrowth literature, identifying and interpreting the semantic structures of research themes over four distinct periods: 1968–2000, 2001–2010, 2011–2020, and 2021–2025. Using term co-occurrence networks built from titles and abstracts, we examine how conceptual clusters emerged, evolved, and diversified over time, providing a detailed account of the shifting intellectual landscape within the field of degrowth. We read these maps at the level of broad thematic formations: the number and identity of the major clusters are stable across specifications, whereas the exact placement of an individual term is more sensitive to the frequency threshold and is therefore treated as indicative rather than definitive (Appendix A.4). Across the four periods analysed, the indexed degrowth literature has evolved from a marginal and biologically coloured discourse into a richly structured, interdisciplinary, and politically engaged field. From the foundational critiques of growth and sustainability, it has expanded into questions of governance, justice, post-capitalist systems, and ecological ethics. The increasing complexity and thematic depth of co-word clusters over time confirm a clear trajectory: from a scattered start to a mature, well-structured field.

1968–2000 in the English-Keyword Corpus: Biological. In the earliest period (1968–2000), the co-word network (Figure 6) reveals a sparse and fragmented structure, with three distinct clusters emerging under a minimal occurrence threshold of 3.

The network is dominated almost entirely by biological vocabulary, confirming that before the 2000s the term “degrowth” circulated mainly in a physiological rather than a social-scientific register. Three clusters emerge, each a distinct facet of the biological usage. The *red* cluster gathers the winter-starvation and tissue-loss literature on freshwater pulmonate snails (freshwater, tissue, laboratory, snails, starvation, *Helisoma*, population). The *blue* cluster covers cellular-regeneration and reproductive-biology studies in flatworms (size, development, cell, oxygen, planarians, reproductive, regeneration, triclads). The *green* cluster gathers the general animal energetics and feeding-physiology literature underlying both (food, rates, animals, measured, water, weight, feeding, uptake). The normative, economic meaning of degrowth is essentially absent.

Only a faint trace of its later normative meaning appears in the corpus. This should not be interpreted as evidence that the intellectual foundations of degrowth were absent. Seminal works such as Georgescu-Roegen (1971)’s entropic critique of economic growth and Daly (1991)’s steady-state economics predate the emergence of degrowth as a research field and later become central to its co-citation knowledge base. They are absent from our corpus because neither uses the term *degrowth*, on which our keyword-based search is defined. The same limitation applies to the concept’s own socio-economic origins. Although *d’ecroissance* was introduced by Grinevald and Rens (1979), more than two decades before the end of this period, that foundational French-language literature falls outside a corpus constructed from the English keyword *degrowth* (the resulting coverage gap is quantified in Appendix A.7). This period should therefore be interpreted not as the beginning of degrowth research, but as the final stage in which degrowth was predominantly a biological term. The socio-economic concept already existed in French, while its English-language intellectual antecedents were articulated under different terminology. Only later did the English term *degrowth* become associated with that socio-economic tradition.

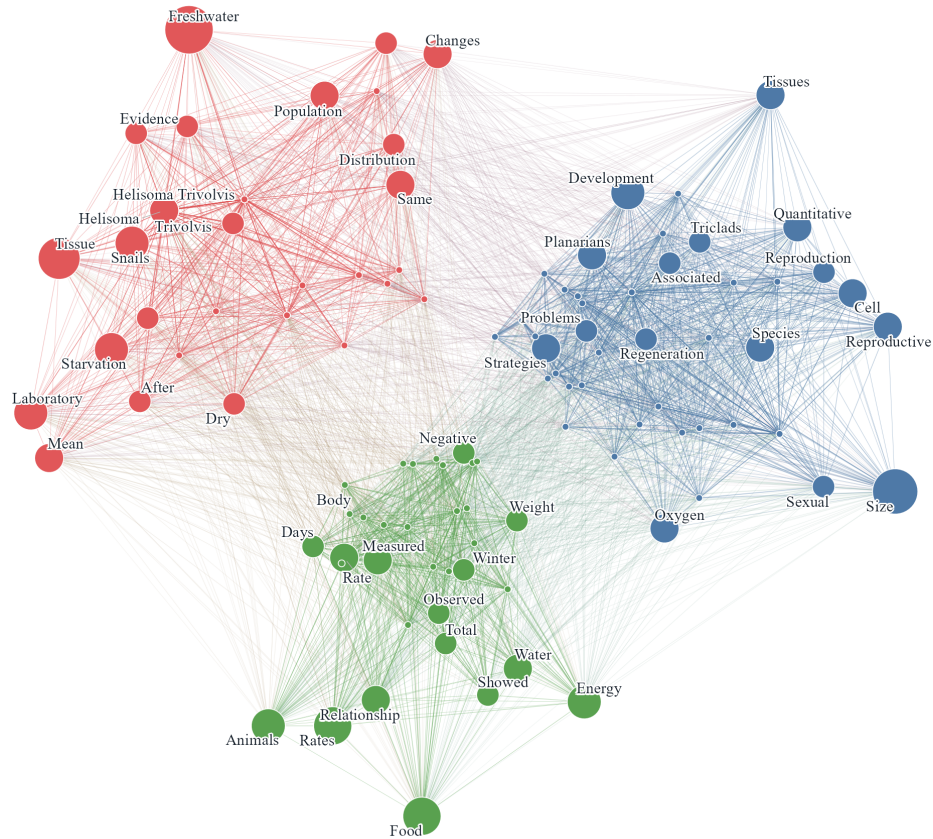


Figure 6: Co-word network (1968–2000)

Notes: This figure displays the co-word network, built from terms extracted from titles and abstracts; clusters are identified with the Leiden algorithm.

2001–2010: Economic Paradigm. In the subsequent decade (2001–2010), the co-word structure captures the emergence of degrowth as a distinct research programme within ecological economics and the broader sustainability literature (Figure 7).

During this transitional decade, degrowth emerged as a coherent socio-economic paradigm while its earlier biological usage receded to the margins.¹³ Four clusters structure the period. The *red* cluster, the largest, gathers the sustainable-development and alternative-economy vocabulary (sustainable development, economic, consumption, economy, movement, alternative, green, policy, resources, theory, western), the direct continuation of the field’s early normative programme. The *blue* cluster (ecological, social, production, sustainability, environmental, equity, efficiency, market, political, discourse, goods) marks the first sustained engagement with production and consumption within a coherent ecological-economic critique. The *orange* cluster carries the field’s French *décroissance* roots into an explicitly political register (*croissance*, society, state, debate, left, economics, environment, values, future, material), while the *green* cluster (increase, model, system, data, change, rate, pattern, human, body) retains a residual, more quantitative vocabulary, the last trace of the corpus’s earlier register. Overall, the

¹³Within the corpus, the socio-economic meaning first appears in 2005 (“Ecology versus Economy? Discussions on Sustainable Development, Selective Degrowth”) and gains further visibility in 2007 through French green politics. Its emergence as a research field is conventionally associated with the first International Conference on Economic De-growth (Paris, 2008), after which annual publications in the corpus rise from a handful of papers to thirteen and continue increasing thereafter.

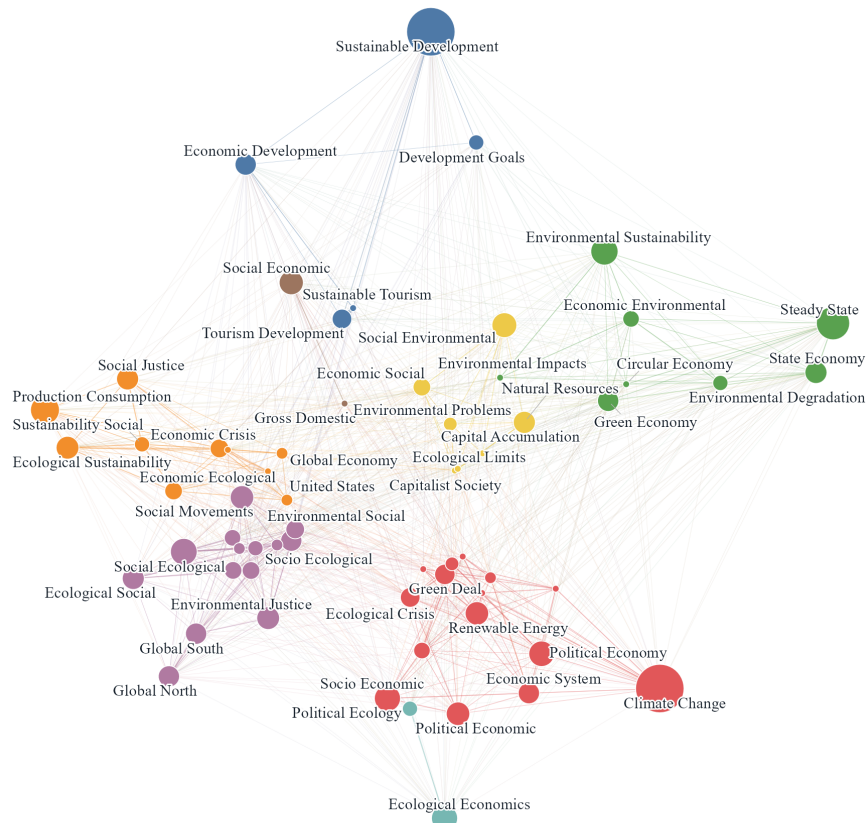


Figure 8: Co-word network (2011–2020)

Notes: This figure displays the co-word network, built from multi-word terms extracted from titles and abstracts; clusters are identified with the Leiden algorithm.

Serge Latouche). The *purple* cluster, nearly as large as the red, merges the field’s transformational core with its post-development and decolonial currents (social-ecological and socio-ecological transformation, environmental justice, social movements, global South and global North, *buen vivir*, voluntary simplicity, and *del decrecimiento*). The *teal* cluster isolates the field’s core disciplinary vocabulary (ecological economics, political ecology); the *yellow* cluster gathers resource and capitalist-critique vocabulary (natural resources, environmental problems, capital accumulation, capitalist society, ecological limits); and the *brown* cluster, the smallest, names generic socio-economic and output vocabulary (social-economic, gross domestic).

In sum, the period 2011–2020 is marked by thematic diversification and intellectual consolidation. Degrowth is no longer merely a critique of economic growth but has matured into a multi-dimensional research programme that encompasses political economy, macroeconomic theory, policy design, ethics, and post-developmental imaginaries. Biological associations have receded to the margins, while governance, justice, and systemic transformation have moved to the centre of scholarly inquiry. The maturation visible across this decade is just what [Weiss and Cattaneo \(2017\)](#) registered in taking stock of degrowth as an emerging academic paradigm.

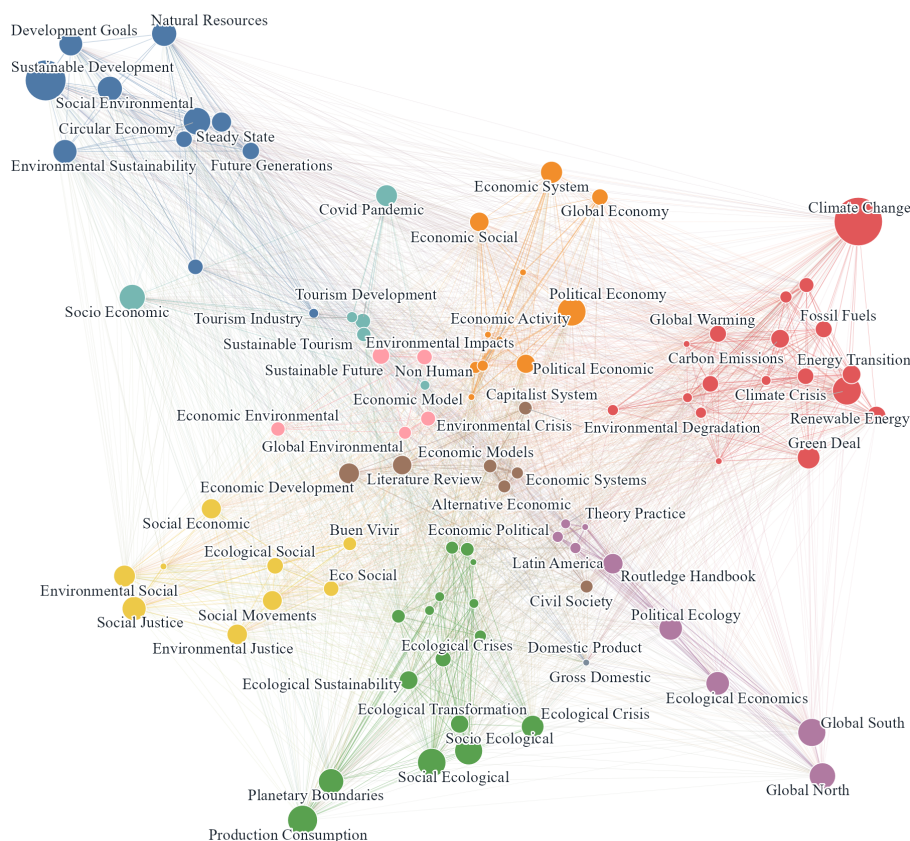


Figure 9: Co-word network (2021–2025)

Notes: This figure displays the co-word network, built from multi-word terms extracted from titles and abstracts; clusters are identified with the Leiden algorithm.

2021–2025: Multipolar Convergence and Normative Synthesis. The most recent period is characterised by an unprecedented proliferation and diversification of research themes. The co-word network (Figure 9) resolves into ten thematic formations spanning energy, sustainability, justice, and post-development concerns. The *red* cluster is the field’s energy-and-climate axis (climate change, climate crisis, green deal, renewable energy, carbon emissions, energy transition, fossil fuels, climate justice, and net zero), articulating the critique of market-based decarbonisation. The *blue* cluster gathers the sustainability, resource, and development-goals agenda (sustainable development, circular economy, natural resources, biodiversity loss, steady state, development goals), while the *green* cluster, the largest, fuses production and consumption with the field’s eco-Marxist and transformational turn (production and consumption, planetary boundaries, social-ecological and socio-ecological transformation, ecological crisis, capital accumulation, urban planning, food systems, policy proposals).

The remaining clusters mark the field’s growing thematic breadth. The *orange* cluster now names political economy and the critique of the capitalist system directly (political economy, economic system, capitalist system, economic activity, non-human, human beings); the *purple* cluster distils the field’s global-South/global-North axis, now fused with its core ecological-economics and political-ecology vocabulary, into a compact decolonial strand (global South, global North, ecological economics, political ecology, Latin America). The *yellow* cluster absorbs environmental and social justice alongside post-

development (social justice, environmental justice, social movements, eco-social, *buen vivir*). The *teal* cluster captures the pandemic-and-tourism turn (socio-economic, COVID-19 pandemic, tourism development, sustainable tourism), while the *brown* cluster, now merging what were previously separate strands, engages economic-systems critique, alternative economic models, and civil society (economic development, alternative economic, economic systems, environmental degradation, civil society, literature review). Finally, the *pink* cluster gathers environmental-impact and crisis vocabulary (sustainable future, environmental impacts, environmental crisis), and the smallest, *grey*, cluster isolates the measurement of economic output itself (gross domestic product).

In sum, the 2021–2025 period marks the consolidation of degrowth as a heterogeneous, deeply interdisciplinary, and ethically expansive research programme. The literature has moved beyond critique to engage with implementation, policy, pedagogy, and post-capitalist visions, while remaining grounded in material and ecological realities, the breadth of a research programme that earlier syntheses had already begun to chart (Kallis, 2018).

3.2.3 Emerging Themes: Bibliographic Coupling

Bibliographic coupling provides a window onto the field’s emerging research frontier. Applied to the degrowth literature, it distinguishes two broad phases of development: a period of conceptual consolidation (2011–2020), followed by a phase of rapid thematic diversification and empirical expansion (2021–2025). As with the co-word maps, we interpret the coupling networks at the level of broad clusters rather than the exact assignment of individual documents, which is more sensitive to the citation threshold and the random seed and is read accordingly (Appendix A.5).

Our analysis reveals an increasingly differentiated research landscape. The early phase consolidates core post-growth arguments, whereas the recent period exhibits a proliferation of thematic niches encompassing post-growth modelling, urban transformation, post-growth business and provisioning, decoloniality, and tourism. This evolution signals a shift from foundational debates toward applied, interdisciplinary engagements with systemic transitions.

Period 2011–2020. The 2011–2020 window represents a phase of intellectual consolidation. Seven clusters capture the core debates and conceptual architectures of this period.

Seven coupling clusters structure the 2011–2020 window (Figure 10). The *red* cluster, the largest, forms the field’s broad and undifferentiated early literature, spanning defining conceptual statements and growth-economics analysis (Kallis et al., 2012; Kallis, 2011). The *blue* cluster assembles political ecology, post-development, and decolonial scholarship (Asara et al., 2015; Demaria et al., 2013, 2019). The *teal* cluster gathers work on innovation, technology, and business practice (Khmara and Kronenberg, 2017; Vandeventer et al., 2019). The *orange* cluster now merges the political economy and governance of degrowth with the empirical debate over growth itself, spanning biophysical modelling of a steady-state economy and critical political-economy accounts of the paradigm shift (O’Neill, 2015; Buch-Hansen, 2018; Buchs and Koch, 2019; D’Alisa and Kallis, 2019).

The remaining clusters mark early sectoral and institutional differentiation. The *purple* cluster develops a dedicated critique of tourism and urban growth (Fletcher et al., 2019; Milano et al., 2019); the *yellow* cluster now merges a critical-theory reading of consumption and capitalism with degrowth transitions and green-growth contrasts for regional development (Gunderson et al., 2018; Stuart et al.,

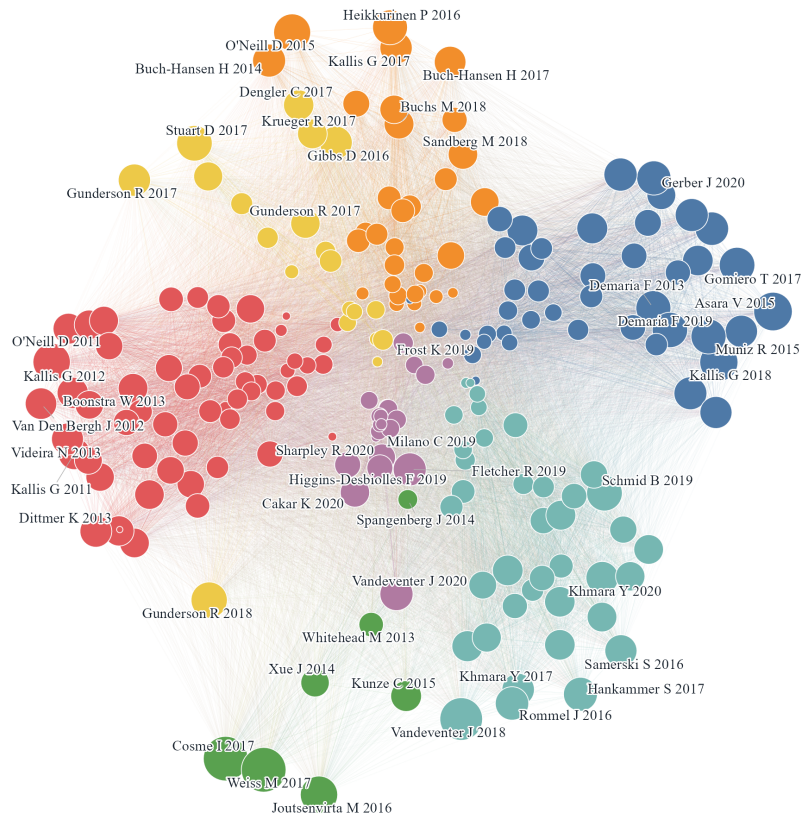


Figure 10: Overview of the emergent clusters (2011–2020)

Notes: This figure displays the bibliographic-coupling network of degrowth documents from 2011–2020 with at least 30 citations (222 documents). Clusters are identified with the Leiden algorithm; node size is proportional to coupling strength.

2017; Gibbs and O’Neill, 2016); and the *green* cluster, now the smallest and most isolated, holds the field’s general stock-taking reviews apart from the applied and institutional literature they once anchored (Weiss and Cattaneo, 2017; Cosme et al., 2017). Together they reveal a centralised intellectual structure anchored in ecological economics and political ecology.

Period 2021–2025: Acceleration and Diversification. The 2021–2025 window reflects rapid thematic expansion and empirical deepening. Twelve clusters, ranging from 42 to 3 documents each, capture the intellectual contours of this diversification.

Twelve coupling clusters capture the diversification of the 2021–2025 window (Figure 11). The *orange* cluster, the largest, advances decolonial degrowth, political ecology, and global justice (Gräbner and Strunk, 2023; Guerrero Lara et al., 2023; Ramcilovic-Suominen et al., 2022). The *red* cluster models the macroeconomic and climate feasibility of post-growth trajectories (Otero et al., 2024; Li et al., 2023). The *purple* cluster concentrates urban degrowth and planning (Savini, 2024; Kaika et al., 2023; Khmara and Kronenberg, 2022; Xue, 2021). The *teal* cluster merges post-growth business, organisational, and technology-innovation scholarship (Sharma et al., 2023; Hankammer et al., 2021).

The remaining clusters mark the field’s growing sectoral and thematic breadth. The *light-blue* cluster forms a dedicated tourism-degrowth subfield (Murray et al., 2023; Dwyer, 2023; Butcher, 2021); the

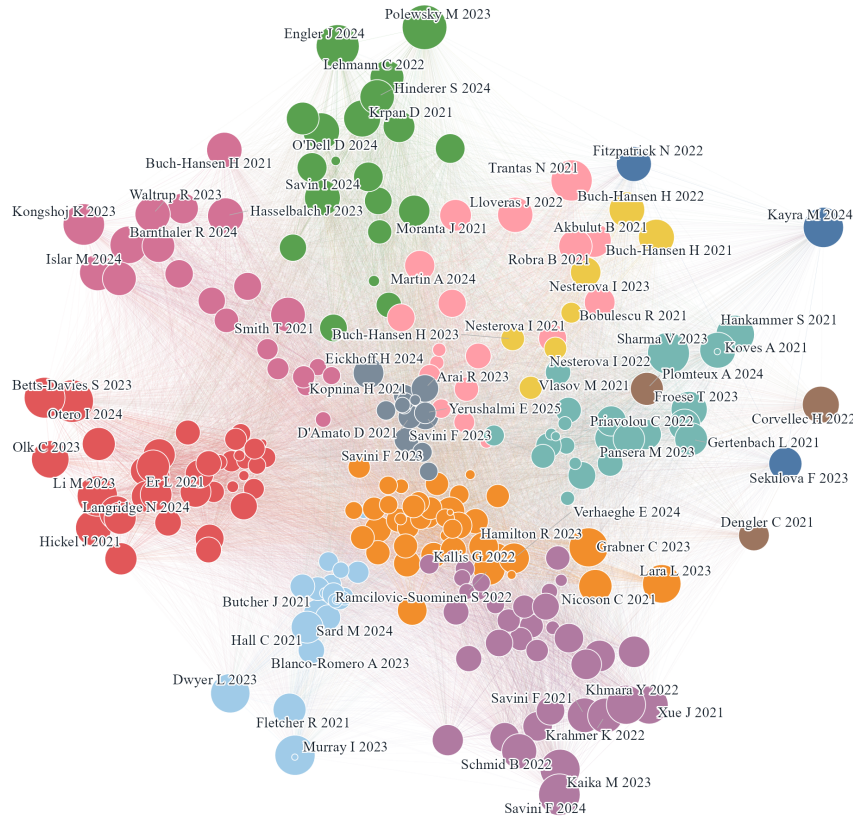


Figure 11: Overview of the emergent clusters (2021–2025)

Notes: This figure displays the bibliographic-coupling network of degrowth documents from 2021–2025 with at least 12 citations (253 documents). Clusters are identified with the Leiden algorithm; node size is proportional to coupling strength.

green cluster gathers the field’s emerging systematic and computational reviews (Engler et al., 2024; Polewsky et al., 2023; Belmonte Ureña et al., 2021); and the *mauve* cluster develops eco-social policy and the political economy of green growth versus degrowth (Kongshøj, 2023; Schulze Waltrup, 2023; O’Donovan, 2024). The *pink* cluster explores the discursive risks facing the term *degrowth* itself, alongside emerging work on needs, well-being, and pedagogy (Trantas, 2021; Helne, 2021); the *grey* cluster critiques circular-economy discourse (Eickhoff, 2024; D’Amato, 2021); the *yellow* cluster, small, revisits post-growth business through a critical-realist lens (Nesterova, 2021); the *brown* cluster, smaller still, examines resourcification and commoning as degrowth practices (Corvellec and Paulsson, 2022); and the *navy* cluster, the smallest alongside brown, gathers institutional and policy-proposal syntheses (Fitzpatrick et al., 2022).

3.3 Robustness

We assess the robustness of our findings through a broad set of sensitivity analyses and validation exercises, organised into three parts: the robustness of the three science-mapping techniques to their construction choices, the sensitivity of the descriptive statistics to counting conventions, and the validity of the corpus boundary itself. The complete set of checks is reported in Appendix A; each paragraph below states what is varied and what the corresponding exercise demonstrates.

Science-Mapping Robustness. The three-cluster knowledge base recovered by the full-sample co-citation network is robust to every perturbation of the network construction we tested, including reference cutoff, resolution, clustering algorithm, random seed, and deduplication choices (Appendix A.2). The reported partition coincides with the modularity-maximising resolution, is reproduced identically by the Louvain algorithm (Blondel et al., 2008), survives fifty random seeds (modal three clusters in forty-eight of fifty; mean adjusted Rand index 0.98), and does not depend on our manual consolidation of duplicate references (adjusted Rand index 0.93). The recovered knowledge base is therefore a property of the data rather than of any particular modelling choice.

The co-word networks are inherently more granular than the co-citation network, so we interpret them at the level of broad thematic formations rather than individual terms and assess their robustness to the term-frequency threshold and the random seed (Appendix A.4). In every period, the number of clusters stays within a narrow range as the threshold varies around its reported value, typically shifting by no more than one or two clusters at the tested extremes. The partition is identical across random seeds in the earliest period and remains modally stable, though less uniformly so, in the other three. The exact position of individual terms is naturally more sensitive to these choices, but the thematic organisation of the maps remains unchanged.

The bibliographic-coupling networks, which map the field’s research frontier, are likewise tested for robustness to the citation-entry threshold and the random seed (Appendix A.5). Both windows are stable to within one cluster under either perturbation, consistent with interpretation at the level of broad thematic formations rather than the exact assignment of individual documents.

Descriptive-Statistics Sensitivity. The descriptive profile of the corpus could depend on how authors and countries are counted, so we re-estimate the two rankings most sensitive to these choices under alternative counting conventions (Appendix A.6). The geographic distribution is virtually unchanged whether publications are assigned by corresponding-author country or by whole counting across all co-author affiliations (Spearman rank correlation 0.95, with an identical top twelve), while the ranking of the most productive authors retains the same core under both full and fractional counting.

Corpus-Boundary Validation. Because the corpus is defined by the presence of the English keyword *degrowth* rather than by the language of publication, it already captures non-English-language works that use this term; accordingly, French, Spanish, and other non-English expressions appear directly in the co-word maps. The remaining concern is different: scholarship published under cognate terms, such as *décroissance* or *decrecimiento*, but never using the English term may be missed. We assess the magnitude of this coverage gap using OpenAlex’s language-independent Degrowth concept (Appendix A.7). Among works identified by this concept but absent from our keyword-defined corpus because they rely exclusively on non-English terminology, we find only about sixty additional documents, representing a few percent of the corpus. This limited number suggests that the omission of cognate-language terminology is unlikely to alter the aggregate structure of the field.

The same keyword definition may also miss adjacent post-growth scholarship expressed through alternative terminology, such as post-growth or steady-state economics. We assess this boundary using OpenAlex’s Degrowth concept classification (Appendix A.8). Among the works assigned to this concept, 90% already contain the term *degrowth*, implying that a broader search based on related con-

cepts would recover only about one hundred and ninety additional documents (seven percent of the corpus). Moreover, because co-citation analysis is based on cited references rather than document titles or abstracts alone, the intellectual foundations shared with adjacent post-growth traditions are already reflected in the knowledge-base analysis. These results suggest that the keyword definition captures the central structure of the field while avoiding substantial contamination from broader but less directly related post-growth debates.

Across these robustness exercises, the main conclusions remain unchanged: the intellectual foundations, conceptual evolution, and emerging research fronts identified in the analysis are not driven by a particular threshold, counting convention, or corpus definition, but reflect persistent structures in the underlying literature.

4 Discussion

Taken together, the three science-mapping analyses point to a common transformation in degrowth scholarship: the field has moved from establishing and articulating its foundational critique toward a more differentiated research programme concerned with empirical assessment, institutional conditions, and the practical implications of post-growth transitions. This transformation is visible in three complementary dimensions. The intellectual core has become increasingly consolidated even as its centre of gravity has shifted toward applied and empirical research; the field's conceptual vocabulary has expanded from a relatively concentrated critique into a more differentiated architecture of ecological, social, and institutional concerns; and the research frontier has diversified into increasingly specialised empirical and sectoral domains. The discussion therefore considers, first, what has changed in the field's intellectual structure, second, how this transformation can be interpreted theoretically, and third, what it implies for the future development of the research programme.

4.1 From Foundational Critique to an Empirical Research Frontier

The first transformation concerns the field's intellectual centre. The three science-mapping analyses indicate that degrowth has evolved less through the replacement of one research agenda with another than through a gradual reorganisation of its intellectual structure. Its foundational critique remains firmly embedded in the knowledge base, but the centre of gravity has shifted toward empirically assessing the environmental limits of continued economic growth and the conditions under which post-growth transitions might be realised. Around this shift, degrowth has developed several characteristics of a maturing research field: a stable knowledge base, a differentiated conceptual vocabulary, and an increasingly specialised research frontier.

On the first question of the knowledge base, the co-citation results point less to novelty than to consolidation. Degrowth rests on a small, stable canon, and the existence of such a shared foundation is itself a hallmark of disciplinary maturity. A concentrated citation core alone, however, is not sufficient evidence of intellectual coherence. Rapidly expanding fields often develop stable citation patterns through preferential-attachment dynamics, even when the underlying scholarship remains conceptually fragmented. What distinguishes the degrowth literature is not simply the existence of a citation core, but its internal organization. Rather than a loose collection of highly cited works, the core forms a coherent intellectual structure whose consolidation extends beyond the three-cluster partition. The clusters are

not separate schools but parts of one connected core: works in different clusters are still heavily co-cited with one another rather than forming self-contained groups (Appendix A.2). The fact that these traditions continue to cite one another extensively suggests that degrowth has developed a shared intellectual space rather than a set of isolated schools.

The applied post-growth and green-growth-critique cluster now forms the canon's densest cluster (its references share the highest mean internal association strength) and, once co-citation is recomputed period by period, its most rapidly expanding one: its share of the knowledge base rises from a marginal presence before 2011 to 49% by 2021–2025, overtaking the foundational core, whose share more than halves over the same span (Figure 5). This expansion indicates a reconfiguration of the field's intellectual structure: the centre of gravity has gradually shifted from primarily articulating degrowth as an alternative vision toward empirically examining whether technological, institutional, and policy-based strategies can deliver sufficient and sustained reductions in environmental pressures, while intensifying the debate over the feasibility of green growth (Hickel and Kallis, 2020; Haberl et al., 2020). The foundational core of degrowth and ecological economics, as well as the political-ecology and post-development strand, remain important intellectual anchors, but the field's recent momentum has shifted toward this empirical front.

On the second question, the conceptual space, the co-word maps show the field's vocabulary being transformed, not merely growing. The most revealing result is the starting point: before 2000 the term “degrowth” was not used as an economic concept within the indexed literature but primarily as a biological term. The socio-economic field did not capture the word so much as repurpose it, emerging in the mid-2000s alongside a physiological usage that persists in regeneration biology to this day; what changed is which meaning came to dominate the literature. Once repurposed, the vocabulary changed in kind, not merely in size. The field did not simply accumulate more publications around the same critique. It developed an increasingly differentiated conceptual architecture linking ecological limits, justice, governance, provisioning, urban transformation, and post-development. This change in the kind of vocabulary, more than the rise in output, is the clearest sign that degrowth has become a field of ideas in its own right.

On the third question, the research front, bibliographic coupling shows the field undergoing structured diversification. Whereas the early-2010s research front remained centred around a relatively small number of foundational debates, the recent frontier has expanded into empirical and sector-specific niches: it runs at once toward operationalisation (modelling, provisioning, post-growth business, urban policy) and toward a globally and decolonially situated discourse. This asymmetry is striking: the sectoral and applied strand, barely visible as a distinct stream in the knowledge base, fragments into five separate clusters at the research front. The contrast also illustrates why the three techniques are complementary rather than interchangeable. Co-citation is inherently backward-looking: it identifies the works that have accumulated citations and become integrated into the field's intellectual canon. Bibliographic coupling is more frontier-oriented: it groups recent documents according to the references they share, capturing emerging research directions before those documents have had time to accumulate substantial citation counts of their own. Co-word analysis captures a different dimension altogether, namely how the field frames its research through the vocabulary it uses, and this conceptual structure can change even when the underlying intellectual canon remains relatively stable. Each method therefore detects a different form of change, operating on a different temporal horizon. Their convergence on the same

underlying transformation is consequently informative rather than circular: the pattern is recovered independently from three distinct relational structures.

These convergent movements carry three implications. Theoretically, degrowth now has the stable canon and shared vocabulary of a maturing field, even as its centre of gravity moves from foundational debate toward applied, sector-specific research. Methodologically, the breadth of the corpus shows that degrowth is no longer the preserve of ecological economics and political ecology but a genuinely cross-disciplinary domain spanning business, energy, urban studies, and tourism. For policy, the turn toward modelling, governance, and provisioning marks a field increasingly able to inform concrete post-growth strategies. Yet the same evidence also identifies the field's unresolved challenge. While degrowth scholarship has become increasingly sophisticated in diagnosing ecological limits and developing alternative economic imaginaries, the institutional mechanisms through which such transitions could be politically achieved remain comparatively underdeveloped. Questions of governance, coalition-building, and distributional conflict therefore remain important unresolved dimensions of the degrowth research agenda, echoing earlier calls to place the politics of transition at the centre of degrowth scholarship ([Hanaček et al., 2020](#)).

At the same time, this interpretation requires caution. The narrative arc from a young and scattered literature to a consolidated, applied, and policy-relevant field is also the type of trajectory that bibliometric self-histories of research domains tend to produce, since expanding literatures mechanically accumulate more clusters, citations, and thematic breadth over time. What supports interpreting the pattern identified here as more than a generic growth trajectory is the convergence of independently computed structures: co-citation (shared references), co-word analysis (shared vocabulary), and bibliographic coupling (shared reference lists) rely on different relational signals, yet they point to the same underlying transformation. This convergence is not mechanically implied by publication growth alone. It also complements prior treatments built on a single relational signal, whether inductive attribute clustering or topic modelling of one debate, by showing that three independently estimated structures agree on the same transformation. External corroboration reinforces this reading: a recent multi-scale bibliometric assessment of ecological economics as a whole, using an entirely separate corpus and method, identifies climate justice and social metabolism as defining themes of the parent field's contemporary phase ([Corsi et al., 2026](#)), echoing from outside the degrowth literature the same shift we document from within it. This empirical account of consolidation and redirection also supports a more explicit theoretical interpretation, taken up next.

4.2 Degrowth as a Maturing Research Programme

Beyond mapping the literature, the results provide a way to interpret degrowth as a maturing research programme rather than as a fixed set of propositions. A useful theoretical lens is [Lakatos \(1970\)](#)'s distinction between a research programme's "hard core" and its "protective belt." We use this vocabulary as a heuristic for characterising structural change, rather than as a claim that the expansion of the protective belt constitutes theoretical or empirical progress in Lakatos's stricter sense, which would require evidence beyond what a bibliometric mapping can provide. The stable and densely interconnected knowledge base identified by the co-citation analysis can be understood as approximating such a hard core, while the expanding set of themes and contributions surrounding it resembles a protective belt through which the field accommodates new questions, extensions, and applications. Its rapid expansion

does not therefore imply that degrowth has abandoned its original ecological-economic foundations. Rather, it is consistent with a research programme whose core commitments remain comparatively stable while its empirical and policy applications become increasingly differentiated. This is maturation through differentiation rather than theoretical rupture. The theoretical contribution of the present mapping is therefore not to define what degrowth should mean, but to show how its intellectual architecture has changed as the field has moved from establishing its foundational critique toward testing and extending its implications. This account of the field's structure also carries concrete implications for where the literature should go next.

4.3 Future Research

First, building on the governance gap identified above, the next stage of the literature should move beyond asking whether degrowth is ecologically desirable or whether particular green-growth pathways are feasible, and examine the conditions under which post-growth transitions could actually be governed. This includes research on institutional design, coalition-building, political conflict, policy sequencing, and the distribution of gains and losses across households, firms, regions, and social groups. Empirical research could, in particular, examine how support for post-growth policies is formed, which political coalitions can sustain them, and how distributional conflicts affect the feasibility and durability of transition. Such work would connect the field's increasingly developed normative and ecological arguments to a more systematic political economy of implementation.

Second, the emerging research frontier identified by bibliographic coupling suggests several promising areas in which the field is expanding faster than its theoretical integration. Post-growth macroeconomic modelling, decolonial degrowth, urban transformation, post-growth business and organisational change, energy transitions, and tourism each form identifiable research niches, but they remain comparatively specialised and only partially connected to one another. Future research could therefore move beyond developing these niches in parallel and examine their interactions. How, for example, do macroeconomic post-growth scenarios translate into changes in urban provisioning systems? Under what conditions can firms adapt their business models to an economy that no longer treats aggregate growth as a primary objective? How do energy transitions interact with questions of sufficiency, employment, and distribution? And how might tourism-dependent regions reconcile reductions in material and energy throughput with livelihoods and local development? These questions would shift the literature from identifying sector-specific pathways toward understanding the systemic interdependence among them.

Third, the geographical structure of the field raises a further theoretical question. The strong concentration of authorship in Europe and North America reflects where degrowth scholarship is institutionally produced, but it does not establish that the conceptual architecture developed in those settings is universally applicable. The growing decolonial strand identified at the research frontier suggests that this question is already entering the field, but its relatively recent and specialised position indicates substantial room for development. Future research led by scholars and institutions in the Global South could therefore examine whether the core concepts of degrowth—including sufficiency, provisioning, well-being, justice, and ecological limits—take the same meaning across contexts with very different historical responsibilities, levels of material consumption, and development needs. Such work would not simply broaden the geographical coverage of the literature; it could test and potentially revise the theoretical boundaries of the research programme itself.

5 Conclusion

This paper has mapped the intellectual landscape of degrowth through a bibliometric analysis of 2,780 peer-reviewed publications (1968–2025), combining co-citation, co-word, and bibliographic-coupling analyses. Its central finding is a structural one: the field’s intellectual centre of gravity has shifted from primarily articulating degrowth as an alternative to growth toward increasing empirical engagement with the environmental feasibility of green growth and the institutional conditions for post-growth transitions. Around that shift, degrowth emerges as a field that has matured along three axes: from conceptual consolidation to thematic diversification, from critique to operationalisation, and from a predominantly European intellectual tradition toward a more globally attentive and increasingly decolonial research agenda. By spanning the full disciplinary range of the field, the study offers the most extensive quantitative mapping of degrowth scholarship to date and complements its many discipline-bound reviews with a macro-level, relational perspective on its past, present, and emerging directions.

The analysis is subject to several limitations. Its corpus is defined by a title- and abstract-level query for the term “degrowth,” which may omit cognate work framed as post-growth, steady-state, or *décroissance* without using the keyword. Abstract coverage is incomplete for older and non-English records, which constrains the co-word analysis for the earliest period. Although the clustering procedures are transparent and robust to alternative specifications, they remain dependent on choices regarding thresholds, network construction, and bibliographic disambiguation.

These limitations point toward future work. Subsequent studies could broaden the query to the wider post-growth lexicon and complement the present macro-level map with focused, qualitative readings of the emerging niches identified here, particularly post-growth macroeconomic modelling, decolonial degrowth, urban transformation, and post-growth business. Whether degrowth ultimately becomes an enduring scientific paradigm or remains one perspective within sustainability science will depend less on further conceptual debate than on its ability to generate empirically grounded knowledge about the governance of socio-ecological transitions.

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A Appendix

This appendix reports the full robustness battery summarised in Section 3.3. Each check re-estimates the relevant network or ranking from the corpus used in the main text, perturbing one analytical choice at a time and comparing the result with the reported solution; a final check (Appendix A.7) instead assesses the language coverage of the keyword-defined corpus. Throughout, the adjusted Rand index (ARI) measures the agreement between a perturbed partition and the partition reported in the paper, with 1.00 denoting an identical clustering; the cluster count records communities with at least three nodes (co-citation and coupling) or two nodes (co-word).

A.1 Corpus retrieval and screening funnel

Table A.1 reports, at each stage of corpus construction described in Section 2, how many records were removed and how many remained, from the initial OpenAlex retrieval down to the final corpus. Querying *degrowth* and *de-growth* separately and combining the results, net of records returned by both queries, gave 4,871 works; requiring the literal search term to actually appear in the title or abstract removed 558 further records. The remaining screening and deduplication steps are then reported cumulatively, each relative to the 4,313 records that survive the literal-match check, so that every stage’s “removed” and “remaining” columns are directly comparable.

Table A.1: Corpus retrieval and screening funnel

Stage	Removed	Remaining
Literal <i>de(-)growth</i> match in title/abstract (Section 2)	–	4,313
Outside 1968–2025 publication-year window	454	3,859
Not an article, review, book, or book chapter	885	2,974
Paratext or retracted record	0	2,974
Preprint, repository, or working-paper venue	78	2,896
Duplicate record (ID, DOI, or title match)	116	2,780
Final corpus	–	2,780

Notes: The literal-match row reports the records remaining after combining the 4,367 *de-growth* and 592 *de-growth* query results (88 cross-query duplicates removed) and requiring the literal search term in the title or abstract. Each subsequent row applies one further criterion, in the order shown, to the records that survived every criterion above it: “removed” is the number of records dropped by that criterion alone (given the preceding ones), and “remaining” is the running total left once it and every criterion above it have been applied. The final deduplication row matches the count reported in Section 2.

A.2 Co-citation knowledge base

We perturb the co-citation map along six dimensions. Table A.2 reports its sensitivity to the number of references retained as nodes: the three-cluster solution is recovered at every cutoff tested except 110, where the search settles on a two-cluster partition before returning to a differently structured three-cluster solution at 120 (discussed below). Table A.3 reports the sensitivity of the partition itself, holding the ninety-node network fixed. The reported resolution coincides with the modularity maximum ($Q = 0.116$ at $\gamma = 1.0$);¹⁴ the Louvain algorithm (Blondel et al., 2008) recovers the identical partition, whereas the

¹⁴The modularity Q is a standard measure of how cleanly a network separates into clusters: it compares the share of link weight falling *within* clusters to what a random wiring of the same nodes would produce, so higher values mean more clearly

agglomerative Walktrap (Pons and Latapy, 2006) and fast-greedy (Clauset et al., 2004) methods return a coarser two-way split that merges two of the three clusters without cutting across them. Replacing association-strength weighting with raw co-citation counts likewise shifts the partition ($\text{ARI} = 0.63$): unnormalised weights give greater influence to the most frequently cited nodes, echoing the coarser split recovered by the frequency-sensitive Walktrap and fast-greedy algorithms above. Association-strength normalisation is therefore a substantive methodological choice rather than a cosmetic one: it reduces the extent to which citation frequency alone drives the cluster boundaries. The solution survives fifty random seeds and does not depend on the manual de-duplication of cited-reference records.

Two clusters is not simply an alternative we declined in favour of three: it is the modularity-inferior choice at every resolution tested. Scanning γ from 0.5 to 1.8 in steps of 0.1, the best two-cluster partition found anywhere on the grid attains $Q = 0.114$ and the best four-cluster partition attains $Q = 0.114$, both strictly below the three-cluster maximum of $Q = 0.116$. The reported resolution is therefore the modularity-maximising choice over the entire scanned range, not a target selected to obtain a particular number of clusters. The random seed is likewise not a free choice made after the fact: at $\gamma = 1.0$, 48/50 of fifty tested seeds converge on a three-cluster partition, and the seed used for the reported results falls within that consensus, with modularity $Q = 0.1158$ against a maximum of 0.1163 across all fifty seeds and a mean adjusted Rand index of 0.98 against the other forty-nine partitions – that is, it reproduces both the typical cluster count and a near-maximal, broadly representative partition, rather than an idiosyncratic one.

Table A.2: Co-citation map: sensitivity to the node cutoff

Cutoff (refs)	Nodes	Clusters	Cluster sizes	ARI vs. reported
70	70	3	29, 28, 13	0.91
80	80	3	33, 32, 15	0.92
85	85	3	35, 34, 16	0.97
90 (reported)	90	3	37, 34, 19	–
100	100	3	46, 37, 17	0.83
110	110	2	55, 55	0.64
120	120	3	43, 42, 35	0.72

Notes: The co-citation network is re-estimated keeping the most-cited references down to each cutoff. Cluster sizes are node counts, and the ARI is computed against the reported ninety-node solution. The three-cluster structure holds through 100 nodes, dips to two clusters at 110, and returns to a differently structured three-cluster solution at 120 (discussed below).

separated clusters. The resolution γ is the parameter of the Leiden algorithm that sets how finely the network is divided, with larger values yielding more and smaller clusters (both are defined in Section 2).

Table A.3: Co-citation map: sensitivity of the partition (ninety nodes)

Perturbation	Clusters	ARI vs. reported
Resolution at the modularity maximum ($\gamma = 1.0$, $Q = 0.116$)	3	1.00
Louvain algorithm	3	1.00
Walktrap / fast-greedy	2	0.60 / 0.59
Association-strength edge weighting	3	0.63
Random seed (modal over 50 seeds)	3 (48/50)	0.98 (mean)
Raw references (manual de-duplication off)	3	0.93

Notes: Q is the modularity (higher means more clearly separated clusters) and γ the Leiden resolution (higher yields more, smaller clusters). Walktrap and fast-greedy merge two of the three clusters into one without splitting any reported cluster across communities; the seed and de-duplication rows report, respectively, the mean pairwise ARI across fifty seeds and the ARI on shared nodes between the canonical and raw-reference networks.

These checks establish that cluster membership and the number of clusters are stable. The thematic labels assigned to each cluster (e.g., “applied post-growth research and the critique of green growth” and “foundational theory”) remain qualitative interpretations of the clusters’ most prominent terms and references rather than outputs directly produced by the algorithm.

The sensitivity to cutoff is non-monotonic rather than a simple coarsening (Table A.2): the three-cluster structure holds through 100 nodes, dips to two clusters specifically at 110, and returns to three at 120, though at 120 the recovered partition has markedly more even sizes (43, 42, 35) than the reported one and a correspondingly lower ARI (0.72), indicating a materially different three-way split rather than a recovery of the same traditions. The dip at 110 is a predictable consequence of which two traditions blur together as increasingly peripheral references are admitted. Tracing node membership between the ninety-node and 110-node solutions shows that political ecology and foundational theory merge into a single community at that cutoff, while the green-growth-critique cluster remains entirely intact (37 of its 37 nodes stay together). This is consistent with the substantive character of the three traditions: political ecology and foundational ecological-economic theory are both predominantly qualitative and conceptual, and both anchor the field’s pre-2011 core (Appendix A.3), so their citation boundary is the first to blur as thinly-connected references dilute the network. The empirical, quantitative green-growth-critique cluster, by contrast, stays cleanly separated even as more peripheral references are added, reinforcing that its distinctiveness is not an artefact of the ninety-node cutoff. We report the ninety-node solution because it is the largest reference set that still recovers all three original traditions without blurring or reshuffling them: at 110 political ecology and foundational theory merge, and at 120 the recovered three-way split no longer corresponds to the same partition (ARI 0.72), so collapsing or reshuffling at a higher cutoff would erase or distort that distinction rather than reveal a more accurate structure.

A.3 Temporal co-citation: migration of the knowledge base

The co-citation map in the main text aggregates the whole period (1968–2025) and so cannot, on its own, show when a cluster rose to prominence. To make the migration explicit, we hold the ninety nodes and their three-cluster assignment fixed from the full-corpus map and recompute co-citation using only the documents published in each period. For period t we restrict to corpus documents with publication year in t , count co-citations among the fixed nodes, and give each cluster its share of the period’s total

node strength,

$$\text{share}_c(t) = \sum_{i \in c} s_i(t) / \sum_i s_i(t),$$

where $s_i(t)$ is reference i 's co-citation strength in period t . Because the cluster identities are fixed, the shares are directly comparable across periods without any cross-period matching. Figure 5 reports the result. The foundational cluster supplies almost the entire knowledge base in 2001–2010 (95.6%) and then declines steadily (61.8%, then 30.4%), while the applied post-growth and green-growth-critique cluster rises from a marginal 3.1% through 12.6% to 48.6%, overtaking the foundational core to become the largest share by 2021–2025. The migration is therefore a property of the data, not of the static layout: the green-growth share grows by 9.5 percentage points across the 2010s and by a further 36.0 across the 2020s. The earliest period (1968–2000) contributes no co-citations among the retained nodes, consistent with the field's knowledge base not yet existing.

A.4 Conceptual structure (co-word)

For each of the four periods, Table A.4 varies the term-frequency threshold around its reported value and reports the resulting cluster count, together with the seed stability at the reported threshold. The number of thematic clusters is stable within a narrow range as the threshold moves, typically shifting by at most one or two clusters at the tested extremes. Seed stability is highest in the earliest period, where the partition is identical across all thirty seeds, and remains modally stable, though less uniformly so, in the other three periods; exact term placement is more sensitive there, consistent with reading these maps at the level of broad thematic formations.

Table A.4: Co-word maps: sensitivity to the frequency threshold and the random seed

Period	Threshold	Terms	Clusters	ARI / seed stability
1968–2000	2	291	2	ARI 0.46
	3 (reported)	113	3	modal 3 (30/30), mean ARI 0.95
	4	51	3	ARI 0.41
2001–2010	3	137	3	ARI 0.16
	4 (reported)	64	4	modal 4 (25/30), mean ARI 0.56
	5	31	3	ARI 0.23
2011–2020	9	113	7	ARI 0.67
	12 (reported)	63	8	modal 8 (13/30), mean ARI 0.70
	15	43	8	ARI 0.54
2021–2025	14	129	9	ARI 0.71
	18 (reported)	94	10	modal 10 (16/30), mean ARI 0.77
	22	65	10	ARI 0.71

Notes: Clusters count communities with at least two nodes. For the reported threshold the cell gives the modal cluster count across thirty seeds (with the number of seeds attaining it) and the mean pairwise ARI against the first seed; for the alternative thresholds it gives the ARI on the terms shared with the reported network.

A.5 Research front (bibliographic coupling)

Table A.5 varies the citation-count entry threshold around its reported value for each coupling window and reports the seed stability at the reported threshold. In both windows, the reported partition is a

one-cluster outlier relative to nearby thresholds: the 2011–2020 window’s reported seven clusters is one fewer than either a looser ($TC \geq 20$) or a stricter ($TC \geq 40$) threshold recovers (both eight), matching its own modal seed solution of eight clusters (14/30 seeds, mean ARI 0.66); the 2021–2025 window’s reported twelve clusters is one more than either a looser ($TC \geq 8$) or a stricter ($TC \geq 16$) threshold recovers (both eleven), matching its own modal seed solution of eleven clusters (16/30 seeds, mean ARI 0.72). Both windows are therefore stable to within a single cluster under any perturbation tested, and we read the reported cluster counts accordingly, as indicative of the field’s degree of thematic fragmentation rather than as precisely delineated categories.

Table A.5: Coupling maps: sensitivity to the citation threshold and the random seed

Window	Citation threshold	Documents	Clusters	ARI / seed stability
2011–2020	≥ 20	269	8	ARI 0.45
	≥ 30 (reported)	222	7	modal 8 (14/30), mean ARI 0.66
	≥ 40	184	8	ARI 0.57
2021–2025	≥ 8	332	11	ARI 0.67
	≥ 12 (reported)	253	12	modal 11 (16/30), mean ARI 0.72
	≥ 16	190	11	ARI 0.73

Notes: Clusters count communities with at least three nodes. For the reported threshold the cell gives the modal cluster count across thirty seeds (with the number of seeds attaining it) and the mean pairwise ARI against the first seed; for the alternative thresholds it gives the ARI on the documents shared with the reported network.

A.6 Counting conventions

Table A.6 re-estimates the two descriptive rankings most exposed to the choice of counting convention. The geographic distribution is almost unchanged whether countries are credited by corresponding author, as reported in the paper, or by whole counting across all co-author affiliations. Author productivity retains the same prolific core under full and fractional counting; fractional counting, which discounts authorship on heavily co-authored papers, reorders the mid-list but leaves the leading authors in place.

Table A.6: Descriptive rankings: sensitivity to the counting convention

Ranking	Baseline vs. alternative	Spearman ρ	Top overlap
Country output	Corresponding author vs. all-author whole counting	0.95	12/12
Author productivity	Full vs. fractional ($1/n$) counting	0.52	11/15

Notes: Spearman ρ is the rank correlation between the baseline and alternative counts across all shared units (77 countries; 3,453 authors). Top overlap is the number of shared entries among the top twelve countries and the top fifteen authors, respectively.

A.7 Language coverage

The corpus is built from a title-and-abstract search for the English term *degrowth* (Section 2); this is a search term, not an author-supplied keyword, and it excludes degrowth scholarship published under cognate terms in other languages. We gauge the size of that gap with OpenAlex. Searching each cognate term directly is misleading, because words such as *décroissance*, *decrecimiento*, and *decrescita* are everyday words for “decrease” and return large volumes of unrelated work (radioactive decay, eigenvalue

decrease, demographic decline). We therefore restrict each term to OpenAlex’s language-independent “Degrowth” subject concept, which keeps only works it classifies as concerned with degrowth and discards the everyday decrease/decay uses.¹⁵

Table A.7 reports the result: the genuinely degrowth-related literature carrying a non-English term is small, under twenty documents per language and roughly sixty in total, a few percent of the corpus. Excluding it therefore does not materially affect the field’s aggregate structure. It does, however, bear on the field’s early intellectual history, since the foundational *décroissance* works, beginning with Grinevald and Rens (1979), predate and fall outside the keyword corpus; we therefore cite them directly in the narrative rather than recover them from the data.

Table A.7: Language coverage: degrowth literature by search term and concept

Term (language)	Raw hits	Degrowth-concept
<i>degrowth</i> (English)	2,985	1,771
<i>décroissance</i> (French)	2,600	19
<i>decrecimiento</i> (Spanish)	1,576	16
<i>Postwachstum</i> (German)	115	13
<i>decrescimento</i> (Portuguese)	386	10
<i>decrescita</i> (Italian)	143	4
<i>decreixement</i> (Catalan)	52	1

Notes: “Raw hits” is an OpenAlex title-and-abstract search for the term; “Degrowth-concept” restricts it to works also carrying OpenAlex’s language-independent “Degrowth” concept.

A.8 Keyword-boundary sensitivity

A second concern about the corpus boundary is that the English keyword *degrowth* may miss adjacent post-growth scholarship framed in other words, such as post-growth, steady-state economics, a-growth, or doughnut economics. We assess this with OpenAlex. Searching the cognate terms directly is uninformative, because the searches are dominated by false positives unrelated to the field: a title/abstract search for “post-growth” returns more than 225,000 records, most of them developmental-biology uses of the phrase, and “a-growth” matches millions of documents containing the words “a growth”. We therefore again use OpenAlex’s language-independent “Degrowth” concept to isolate the genuinely degrowth-related works carrying each cognate term. Table A.8 reports the result: once disambiguated, each cognate framing is small (a few dozen to roughly two hundred degrowth-concept works). More directly, of the 1,960 works OpenAlex assigns to the Degrowth concept, 1,771 (90%) contain the word *degrowth* in their title or abstract, so only about 189 degrowth-related works (10% of the concept) would be added by broadening the query, too few to alter the field’s aggregate structure. A further reason the boundary matters little is structural: the co-citation knowledge base is built from the references *cited* by the corpus, so post-growth work that builds on the same foundational texts is already reflected in the co-citation structure even when it falls outside the keyword.

¹⁵OpenAlex tags each work with subject concepts; restricting the search to its “Degrowth” concept keeps only works classified as about degrowth and discards the everyday “decrease/decay” and biological-shrinkage uses.

Table A.8: Keyword-boundary sensitivity: adjacent post-growth framings

Term	Raw hits	Degrowth-concept
<i>degrowth</i> (reference)	2,985	1,771
post-growth	226,258	184
steady-state economy	7,965	39
prosperity without growth	1,812	21
wellbeing economy	5,245	30
doughnut economics	219	10

Notes: OpenAlex title-and-abstract searches, restricted to articles, reviews, books, and book chapters published up to 2025. “Raw hits” counts every record matching the term and is dominated by unrelated uses (for example, “post-growth” in developmental biology); “Degrowth-concept” restricts the same search to works carrying OpenAlex’s language-independent “Degrowth” concept. “a-growth” is omitted because the search matches the ordinary phrase “a growth” in millions of records and cannot be disambiguated by counts alone.