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The Transformation Paradox of Emerging Fields

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A Bourdieusian Approach to the Bibliometric Study of Sustainability Science

THE SWEDISH SCHOOL OF LIBRARY AND INFORMATION SCIENCE
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Cover image: Piet Mondrian, *Lozenge Composition with Yellow, Black, Blue, Red, and Gray* (1921). The Art Institute of Chicago. CC0 Public Domain (via Wikimedia Commons). The painting's rotated orthogonal grid—maintaining structural stability while shifting orientation—resonated with the themes explored in this thesis, particularly the tension between transformation and the persistence of underlying structures.

Abstract

How can a field that promotes transformation and interdisciplinarity simultaneously reproduce the academic hierarchies it seeks to transcend? This thesis examines sustainability science as an emerging interdisciplinary field, mobilising Pierre Bourdieu's field theory to analyse how symbolic capital, legitimacy, and recognition become structured as durable institutional forms during field formation.

Drawing on four complementary studies, the thesis traces three decades of intellectual and institutional development in sustainability science through an analytical framework combining bibliometric mapping, network analysis, and interpretive analysis of editorial discourse. It demonstrates how symbolic reward structures—such as journal hierarchies, editorial networks, and citation practices—do not function as neutral measures of scholarly contribution, but act as instruments in ongoing struggles over field boundaries and legitimate participation.

The thesis employs a reflexive multimethod design to map sustainability science across multiple analytical dimensions, integrating bibliometric analysis, social network analysis (SNA), geometric data analysis (GDA), and qualitative content analysis (QCA). Using citation and co-authorship patterns, published editorials, and the composition of editorial boards in a selected set of journals central to sustainability science, the thesis reconstructs the field's intellectual and social organisation, tracing how recognition structures crystallise into durable institutional forms. The analysis identifies three historical phases—Foundation (1993–2002), Introspection (2003–2012), and Diversification (2013–2022)—each marked by shifts in epistemic orientation and the redistribution of symbolic capital. Editorial discourse functions as a central site of symbolic struggle, where competing visions of sustainability science—and rival claims to definitional authority—are articulated and contested.

The thesis reframes the empirical analysis through field-theoretical concepts, foregrounding recognition, hierarchy, and symbolic power. By treating bibliometric indicators not merely as analytical tools but as socially embedded instruments of valuation, the study contributes to library and information science (LIS)—particularly scientometrics, bibliometrics, and scholarly communication—while engaging sociological perspectives on science. The findings provide

a critical account of how emerging interdisciplinary fields institutionalise authority while reproducing academic stratification—often in tension with their programmatic commitments to transdisciplinarity and post-normal science.

Svensk sammanfattning

Hur kan ett forskningsfält som främjar transformation och interdisciplinaritet samtidigt reproducera de akademiska hierarkier som det säger sig vilja överskrida?

Denna avhandling undersöker hållbarhetsvetenskap (*sustainability science*) som ett framväxande tvärvetenskapligt forskningsfält och använder Pierre Bourdieus fältteori för att analysera hur symboliskt kapital, legitimitet och erkännande struktureras i varaktiga institutionella former under fältets framväxt.

Med utgångspunkt i fyra kompletterande studier följer avhandlingen tre decennier av intellektuell och institutionell utveckling inom hållbarhetsvetenskapen genom ett multimetodiskt ramverk som integrerar bibliometrisk kartläggning, nätverksanalys och tolkande analys av editorials. Studien visar hur symboliska belöningsstrukturer, såsom tidskriftshierarkier, redaktionella nätverk och citeringspraktiker, inte fungerar som neutrala mått på vetenskapliga bidrag, utan verkar som instrument i pågående strider om fältets gränser och om vem som ses som legitim deltagare.

Med denna ram som utgångspunkt tillämpar avhandlingen ett reflexivt, multimetodiskt forskningsupplägg som integrerar bibliometrisk analys, social nätverksanalys (SNA), geometrisk dataanalys (GDA) och kvalitativ innehållsanalys (QCA) för att kartlägga hållbarhetsvetenskapen längs flera analytiska dimensioner. Genom analyser av citerings- och samförfattarmönster, publicerade editorials samt sammansättningen av redaktionella råd i ett urval av tidskrifter som är centrala för hållbarhetsvetenskapen rekonstruerar avhandlingen fältets intellektuella och sociala organisation och visar hur erkännandestrukturer stabiliseras till varaktiga institutionella former. Analysen identifierar tre historiska faser – grundande (1993–2002), introspektion (2003–2012) och diversifiering (2013–2022) – som var och en kännetecknas av förändringar i epistemisk orientering och en omfördelning av symboliskt kapital. Redaktionell diskurs framträder som en central arena för symbolisk kamp, där konkurrerande visioner av hållbarhetsvetenskap – och rivaliserande anspråk på definitionsmakt – artikuleras, ifrågasätts och selektivt legitimeras.

Avhandlingen omtolkar den empiriska analysen i fältteoretiska termer och synliggör därigenom erkännande, hierarki och symbolisk makt. Genom att betrakta bibliometriska indikatorer inte enbart som analytiska verktyg utan som socialt in-

bäddade värderingsinstrument bidrar studien till biblioteks- och informationsvetenskapen (B&I) – särskilt scientometri, bibliometri och forskning om vetenskaplig kommunikation – samtidigt som den anlägger sociologiska perspektiv på vetenskap. Resultaten bidrar med ett kritiskt perspektiv på hur framväxande tvärvetenskapliga forskningsfält institutionaliserar auktoritet samtidigt som de reproducerar akademisk stratifiering – ofta i spänning med sina programförklarade åtaganden om transdisciplinaritet och postnormal vetenskap.

Riassunto in italiano

Come può un ambito scientifico che promuove la trasformazione e l'interdisciplinarità riprodurre, al contempo, le gerarchie accademiche che aspira a trascendere? Questa tesi di dottorato esamina la scienza della sostenibilità in quanto area interdisciplinare emergente, avvalendosi della teoria dei campi di Pierre Bourdieu per analizzare come capitale simbolico, legittimità e riconoscimento scientifico si strutturino in forme istituzionali durevoli durante il processo di formazione del campo.

Attraverso quattro studi complementari, la tesi ripercorre tre decenni di sviluppo intellettuale e istituzionale della scienza della sostenibilità, impiegando un quadro analitico che integra mappatura bibliometrica, analisi reticolare e analisi interpretativa del discorso editoriale. Il presente studio dimostra come le strutture di ricompensa simbolica — quali le gerarchie tra riviste, le reti editoriali e le pratiche di citazione — non funzionino come misure neutrali del contributo scientifico, ma agiscano come strumenti nelle lotte in corso per la definizione dei confini del campo e della partecipazione legittima alle sue attività.

La tesi adotta un approccio multimetodologico riflessivo per rappresentare la scienza della sostenibilità attraverso molteplici dimensioni analitiche, integrando analisi bibliometrica, analisi delle reti sociali (SNA), analisi geometrica dei dati (GDA) e analisi qualitativa del contenuto (QCA). A partire da modelli di citazione e di collaborazione tra autori, il testo di articoli editoriali e la composizione dei comitati editoriali di un campione selezionato di riviste centrali per la scienza della sostenibilità, la tesi ricostruisce l'organizzazione intellettuale e sociale del campo, mostrando come le strutture di riconoscimento si cristallizzano in forme istituzionali durevoli. L'analisi identifica tre fasi storiche — Fondazione (1993–2002), Introspezione (2003–2012) e Diversificazione (2013–2022) — ciascuna caratterizzata da mutamenti nell'orientamento epistemico e dalla ridistribuzione del capitale simbolico. Attraverso queste fasi, il discorso editoriale costituisce un terreno centrale di lotta simbolica, in cui visioni contrapposte della scienza della sostenibilità — e rivendicazioni rivali sull'autorità di definire il campo — vengono articolate e contestate.

La tesi rilegge l'analisi empirica attraverso concetti di teoria dei campi, ponendo in primo piano riconoscimento scientifico, gerarchie e potere simbolico. Trattando gli indicatori bibliometrici non semplicemente come strumenti analitici, ma come mezzi di valutazione socialmente situati, questa ricerca contribuisce alla biblioteconomia e scienza dell'informazione — in particolare alla scientometria,

alla bibliometria e agli studi della comunicazione scientifica — dialogando al contempo con le prospettive derivate dalla sociologia della scienza. I risultati offrono un resoconto critico di come i campi interdisciplinari emergenti istituzionalizzino l'autorità, pur riproducendo la stratificazione accademica — spesso in tensione con le proprie dichiarazioni programmatiche di transdisciplinarità e postnormalità.

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Articles Included in This Thesis

Article I: Schirone, M. (2023). Field, capital, and habitus: The impact of Pierre Bourdieu on bibliometrics. *Quantitative Science Studies*, *4*(1), 186–208. https://doi.org/10.1162/qss_a_00232

Article II: Schirone, M. (2024). The formation of a field: Sustainability science and its leading journals. *Scientometrics*, *129*, 401–429. https://doi.org/10.1007/s11192-023-04877-1

Article III: Schirone, M. (2025). The emergence of sustainability science in the editorials of three scholarly journals. *Discover Sustainability, 6*, Article 688. https://doi.org/10.1007/s43621-025-01519-9

Article IV: Schirone, M. (2025). *Symbolic capital and inequality in scholarly communication: A bibliometric study of editorial boards* [Preprint]. https://doi.org/10.31235/osf.io/v8zmp_v3

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List of Abbreviations

ANT – Actor–network theory

EVC – Eigenvector centrality

GDA – Geometric data analysis

HCKB – Highly cited knowledge base

JCI – Journal Citation Indicator

LIS – Library and information science

MCA – Multiple correspondence analysis

PCA – Principal component analysis

PNS – Post-normal science

QCA – Qualitative content analysis

SCI – Science Citation Index

SCIM – Symbolic capital institutionalisation model

SDGs – Sustainable Development Goals

SNA – Social network analysis

STS – Science and technology studies

1. Introduction

Sustainability science emerged in response to urgent global challenges—such as climate change, biodiversity loss, and social inequality—through integrative, interdisciplinary, and problem-oriented approaches. It builds on earlier traditions of sustainability-oriented, problem-focused research (Clark, 2007; Conrad, 2002). From its inception, the field has positioned itself as transformative (Kates et al., 2001), advancing an explicitly solution-oriented research agenda that foregrounds inclusivity and societal relevance as core commitments (Miller et al., 2014). Yet despite its rapid growth and increasing institutional visibility, the field remains in formation: its boundaries and internal coherence are "not completely settled or solidified" (Nagatsu et al., 2020, p. 1808), with ongoing debates over conceptual foundations, methodological approaches, and disciplinary positioning (Jerneck & Olsson, 2020; Schlüter et al., 2019).

This unsettled character raises a critical question: how does a field committed to transformation structure itself institutionally? When legitimacy is defined by the capacity to address urgent societal problems, institutional arrangements acquire particular significance—they become sites of scrutiny precisely because the field's authority depends on its ability to realise its stated commitments. While previous research has examined the conceptual development of sustainability science and traced the evolution of its core ideas (e.g., Kajikawa, 2008; Kates et al., 2001; Nagatsu et al., 2020), systematic analyses of its institutional organisation—particularly how authority is consolidated through journals, editorial structures, and scholarly networks—remain limited. Although bibliometric studies have mapped publication and citation patterns (e.g., Bettencourt & Kaur, 2011; Kajikawa et al., 2007), few have connected these patterns to broader questions of power, recognition, and field formation.

The institutional development of sustainability science has taken multiple forms, including the expansion of dedicated academic programmes, the establishment of research centres, and the emergence of professional societies and networks (Bettencourt & Kaur, 2011; Clark & Harley, 2020). As shown by large-scale analyses of the field's evolution and structure, sustainability science has undergone rapid growth, geographic expansion, and increasing institutional consolidation as a distinct research domain (Bettencourt & Kaur, 2011). While these institutional dimensions have been explored in previous research (Bettencourt & Kaur, 2011; Clark & Harley, 2020), comparatively less attention has been paid to the infrastructures of scholarly communication. This thesis therefore focuses on scholarly

communication structures—specifically publication, citation, and editorial gatekeeping—as key mechanisms through which academic recognition is structured and authority is consolidated.

Focusing on scholarly communication structures highlights how field formation involves not only conceptual development but also the organisation of legitimacy within the field. A persistent tension emerges: while sustainability science promotes ideals of interdisciplinarity, inclusivity, and transformative change, its authority is consolidated through conventional academic mechanisms—a relatively small number of prominent journals, interconnected editorial networks, and competitive publication systems. These dynamics tend to privilege established actors and reproduce institutional hierarchies within the field.

To understand these dynamics, I draw on Pierre Bourdieu's theoretical framework of fields and forms of capital (Bourdieu, 1975, 1986, 2004). From this perspective, scientific fields are structured social arenas in which actors compete for recognition by accumulating and converting different forms of capital: economic, cultural, social, and symbolic (Bourdieu, 1996). Symbolic capital, in particular, refers to the prestige and legitimacy conferred through recognition. It becomes institutionalised in durable structures such as journals, in relatively stable gatekeeping bodies like editorial boards, and in dynamic systems such as citation networks. Field theory thus provides a means for analysing how sustainability science articulates transformative ambitions while remaining embedded in institutional mechanisms that concentrate authority and reproduce academic hierarchies.

Within this framework, sustainability science provides a context for examining how legitimacy is negotiated through scholarly communication structures. The field articulates commitments to interdisciplinarity, inclusivity, and societal engagement—yet must secure recognition through conventional academic structures such as peer-reviewed journals, competitive publication systems, and editorial gatekeeping. I conceptualise this tension as a *transformation paradox*: to gain legitimacy, fields oriented towards transformation must accumulate symbolic capital through institutional mechanisms whose hierarchical and exclusionary logics they often critique. While similar contradictions might be present in other emerging fields, sustainability science's explicit normative engagement with global equity and systemic change renders this paradox especially visible—and analytically significant.

Article I establishes the theoretical and methodological conditions for this analysis by mapping how Bourdieu's field theory has been received and operationalised in bibliometric research. Articles II–IV then examine how the transformation paradox manifests across three interrelated dimensions of sustainability science's institutional organisation. Article II maps symbolic hierarchies among journals to reveal patterns of differentiation and stratification. Article III analyses how the conceptualisation of sustainability science evolves in published editorials, examining how journals articulate and negotiate the field's epistemic boundaries and normative commitments over time. Article IV examines editorial board composition as a gatekeeping structure, tracing how symbolic capital becomes concentrated through overlapping membership across editorial boards and patterns of institutional, geographic, and gender representation. These studies show how symbolic capital becomes embedded in organisational structures, consolidating authority in ways that both enable and constrain the field's transformative aspirations.

1.1 Disciplinary Positioning and Methodological Approach

This study is situated within the subfields of bibliometrics and scientometrics (see Leydesdorff, 2001), which are part of the broader discipline of library and information science (LIS). Bibliometrics focuses on measuring patterns of publication, citation, and collaboration, while scientometrics examines how these patterns reflect the structure and dynamics of scientific fields (De Bellis, 2009). Both subfields contribute to the study of scholarly communication—a core area within LIS concerned with how journals, editorial systems, citation networks, and metadata infrastructures shape the circulation, evaluation, and legitimation of knowledge (Åström, 2007). Building on this tradition, the thesis investigates how sustainability science becomes institutionalised through scholarly communication mechanisms that mediate recognition and authority. This positioning grounds the research within LIS while also supporting a Bourdieusian analysis of how symbolic capital becomes embedded in scientific communication infrastructures (Cronin, 2005; Wouters, 2014).

I treat bibliometric indicators as both analytical instruments and objects of inquiry in their own right. Journals, indicators, and citation networks are representations of scientific activity, but also institutional devices that actively shape authority, visibility, and recognition (Hammarfelt & Rushforth, 2017). Field theory thus

provides a lens for analysing how bibliometric tools, such as citation networks and indicators, reflect and reinforce hierarchies of symbolic capital. This study contributes to a growing body of scientometric research that integrates Bourdieu's field theory by combining quantitative bibliometric analyses with qualitative and theoretically informed interpretations of inequality, symbolic capital, and field dynamics (e.g., Boshoff et al., 2024; Koch et al., 2025).

The integration of Bourdieu's field theory with reflexive bibliometrics results in the Symbolic Capital Institutionalisation Model (SCIM). Developed inductively from the empirical analyses in Articles II–IV, the model's constituent concepts and mechanisms emerge across distinct empirical domains. SCIM provides a framework for understanding how emerging fields establish legitimacy by accumulating, converting, and stabilising different forms of capital across multiple institutional sites and symbolic systems—including journals, editorial boards, and citation structures. By synthesising Bourdieu's field theory with insights from research on scientific and intellectual movements (Frickel & Gross, 2005), SCIM helps explain how emerging interdisciplinary fields negotiate tensions between normative aspirations and the structural constraints of the academic system. These components are integrated in Chapter 4, where SCIM is presented as the framework constituting the theoretical core of the thesis.

1.2 Aim and Research Questions

This investigation focuses on the institutional consolidation of sustainability science over the past three decades, as reflected in publication patterns, journal structures, and editorial discourse. The analysis does not evaluate the quality or societal impact of individual research contributions, nor assess whether the field has succeeded in realising its stated commitments. Instead, the purpose of this study is to provide a systematic account of how scholarly communication structures shape the institutionalisation of sustainability science, thereby contributing to a deeper understanding of how academic authority is constructed and maintained in the field.

The study is primarily intended to contribute to research in library and information science, particularly in scientometrics, bibliometrics, and scholarly communication. By examining how recognition and authority are structured through these processes, the findings are also relevant for actors involved in academic publishing, research evaluation, and editorial governance, as well as for scholars seeking to understand the institutional dynamics of sustainability science.

To examine these structural processes, I adopt a relational and reflexive methodological framework that integrates bibliometric mapping, social network analysis, and qualitative content analysis, enabling the examination of both field-level structural patterns and their institutional and discursive articulation. The analysis is guided by four interrelated research questions:

RQ1. How can Bourdieu's theories on capital and field be applied to the publication, collaboration, and citation patterns of sustainability science?

RQ2. How can bibliometric methods, informed by a Bourdieusian perspective, be developed to describe the social and intellectual organisation of sustainability science, and how can qualitative insights complement these analyses?

RQ3. How can the process of institutionalisation in sustainability science be described through patterns revealed by quantitative and qualitative analyses of its publication output?

RQ4. How do editorial board structures in sustainability science journals reflect broader power relations in the social and intellectual organisation of the field?

The four articles included in the thesis address these questions empirically through distinct analytical lenses. The organisation of the thesis and the relationship between the summary essay and the four articles are outlined below.

1.3 Structure of the Thesis

This thesis consists of a summary essay and four journal articles. The summary essay is organised into eight chapters.

Chapter 2 traces the conceptual evolution of bibliometrics, from its early instrumental role in information management to its contemporary reflexive and field-theoretical interpretations. Chapter 3 examines sustainability science as an emerging interdisciplinary field, outlining its epistemic foundations, institutional development, and key bibliometric studies that have mapped its evolution. Chapter 4 presents the theoretical framework, integrating Bourdieu's field theory to analyse how symbolic capital, recognition, and authority are produced and contested within scientific fields. Chapter 5 details the methodological design, describing the integration of bibliometric mapping, network analysis, and qualitative content analysis, and specifying data sources, analytical techniques, and the rationale for combining quantitative and qualitative approaches.

Chapter 6 provides an overview of the four constituent articles, explaining how each addresses distinct empirical dimensions while remaining unified by the overarching field-theoretical framework. Chapter 7 integrates the main findings across the articles in relation to the research questions, showing how the institutionalisation of sustainability science can be understood in relation to broader dynamics of field formation. Chapter 8 synthesises the theoretical, empirical, and methodological contributions of the thesis, discusses implications for research and for practices related to scholarly communication and research evaluation, acknowledges limitations, and outlines directions for future research in library and information science, particularly in scientometrics, bibliometrics, and scholarly communication.

As the chapters unfold, a central argument takes shape: the transformation paradox emerges not as an anomaly, but as a structural feature of field formation. By examining how sustainability science operates within established academic systems, the thesis reveals how emerging fields negotiate recognition and, in the process, reproduce, adapt, or reshape existing configurations of scientific authority.

2. Reflexive Bibliometrics

The theoretical assumptions and historical lineages shape how bibliometric indicators are designed, interpreted, and used—and therefore what they can and cannot reveal about emerging fields (Hammarfelt, 2011; Leydesdorff et al., 2018). This chapter, therefore, surveys major traditions in bibliometric thought, moving from instrumentalist origins in information management, through Mertonian and constructivist interpretations of citation, to reflexive approaches that treat indicators as performative devices in the governance of science. It also examines the ethical and governance-related consequences of indicator use, with particular attention to inequalities in recognition and visibility.

2.1 Theoretical Directions in Bibliometrics: From Information Management to Field Analysis

Originally developed as tools for information retrieval, bibliometric methods have evolved through sociological, constructivist, and reflexive approaches that now treat indicators as part of the governance of science. This section traces that trajectory across three interrelated dimensions (Guns, 2013): documentary (publications), social (agents and institutions), and epistemic (concepts and knowledge structures). The shift is from measuring science to participating in its construction, clarifying how knowledge is structured, valued, and governed.

2.1.1 Instrumentalist Foundations: Information Retrieval and Quantification

Bibliometrics has its intellectual origins in early twentieth-century work on statistical bibliography and documentation, and emerged in response to the rapid growth of scientific publishing, which John Desmond Bernal characterised as an "enormous and chaotic structure" (1939, p. 117). Derek John de Solla Price captured this challenge as the "explosion of science" in his book *Little science, big science* (De Solla Price, 1963, p. 14). This exponential growth in scientific publications demanded new methods for navigating and making sense of the scholarly literature.

While bibliometrics was formally institutionalised in the post-war decades, its intellectual roots go back to the early twentieth century. Foundational ideas

emerged from Edward Wyndham Hulme's work on statistical bibliography and Paul Otlet's theories on documentation systems (Nelhans, 2022). The introduction of Lotka's law of scientific productivity and Bradford's law of scattering complemented these developments, establishing key epistemic reference points for the field (Rousseau et al., 2018).

Bernal's *The social function of science* further promoted the empirical study of science as a structured social activity (1939). The Soviet term *naukometriya* (scientometrics), proposed in 1969, marked an effort to formalise the quantitative analysis of science (Rousseau et al., 2018). These intellectual developments reflected a growing conviction that science itself could be studied systematically and rendered visible through measurement.

Eugene Garfield's interventions were pivotal in turning these scattered insights into an operational infrastructure for the measurement and understanding of scientific output. His Science Citation Index (SCI) reimagined citations as machine-readable links within the scientific record (Garfield, 1955, 1964). This tool, along with innovations like bibliographic coupling (Kessler, 1963), journal impact metrics (Garfield & Sher, 1963), and co-citation analysis (Small, 1973), shared a core positivist assumption: that citation frequency could serve as a quasi-objective proxy for intellectual influence.

Despite early ambivalence from practising scientists (Wouters, 1999), this emerging bibliometric infrastructure enabled the mapping and quantification of science itself. De Solla Price's exponential-growth curves and network analyses provided an empirical vocabulary that resonated with Kuhn's account of paradigms and scientific revolutions (De Solla Price, 1963, 1965; Kuhn, 1970). Small's clustering algorithms, meanwhile, offered a method for identifying evolving research fronts (Small, 1973). These developments positioned bibliometrics both as a "science of science" and as a practical infrastructure for the governance of science (De Solla Price, 1963; Garfield, 2009).

2.1.2 The Mertonian Turn: Citations as Symbolic Credit

A theoretical shift occurred when bibliometricians began to draw on Robert K. Merton's sociology of science (Merton, 1973, 1979). Merton's theories provided the interpretive break that transformed citations from tools for information retrieval into a form of symbolic currency within the scientific reward system. He argued that science operates through a moral economy of recognition, built on the CUDOS norms: Communalism, Universalism, Disinterestedness, and Organised

Scepticism. In this system, discoveries are shared publicly (communalism), but reputation accrues to the individual, provided their claims are judged by universal criteria and vetted critically. Citations, therefore, function as formal acknowledgements of intellectual debt and, consequently, as tokens of credit.

Merton (1968) introduced the "Matthew effect", drawing on multiple empirical sources—including Harriet Zuckerman's interviews with Nobel laureates (Zuckerman, 1967) and documentary evidence from scientists' diaries, letters, notebooks, publications, and biographies. Merton synthesised these observations into a sociological model in which the prior recognition and prestige of eminent scientists produce further recognition and credit, reinforcing status hierarchies over time within the moral economy of science.

Later, Merton revisited the Matthew effect to examine its broader implications, particularly the institutional logic through which credit and recognition accumulate in science (Merton, 1988). Merton emphasised that the allocation of recognition is not merely descriptive but actively shapes scientific careers and institutional advancement. He further acknowledged that his long collaboration with Zuckerman over two decades had deepened and refined the concept (Merton, 1988). In this revised account, Merton underscored that recognition systems operate through institutional processes governed by scientific norms.

However, subsequent scholarship has demonstrated that cumulative advantage is structured by more than eminence alone; social position profoundly shapes recognition patterns. As Rossiter (1993) argued, Merton's formulation focused on how the already prominent accumulate credit at accelerating rates (the "rich get richer" dynamic), while neglecting how marginalised groups are systematically denied recognition (the complementary "poor get poorer" pattern). Rossiter termed this the "Matilda effect", after the nineteenth-century feminist writer and suffrage activist Matilda Joslyn Gage, whose work exemplified this pattern of historical erasure. The Matilda effect dynamic reveals why women scientists are systematically denied recognition even for substantive contributions.

Together, the Matthew and Matilda effects show that the scientific reward system not only amplifies advantage but actively reproduces structural inequality along lines of academic status and gender. Later quantified in empirical studies (Kozlowski et al., 2024; Langfeldt et al., 2015; Tol, 2013), these dynamics create a system in which established researchers—disproportionately male and Western—gain resources and visibility at an accelerating rate, while newcomers and historically marginalised groups face systematic barriers to recognition.

These structural patterns complicate any straightforward use of citations as impact indicators—a concern identified early in bibliometric scholarship. Kaplan (1965) argued that citation practices are embedded in tacit academic norms and serve multiple social functions. Rather than neutral acknowledgements, Kaplan saw citations as strategic signals used to confer legitimacy, assert intellectual property, or even deflect responsibility. His work was an early warning against treating citation counts as objective measures of impact or quality. This concern was later validated by Cano (1989), whose study of elite scientists found that over a third of citations were perfunctory—used mainly to "set the stage" rather than engage substantively with the cited work.

As Wouters (1999) argued, Merton's reframing of citations as reward tokens—with all the inequities that entails—ultimately gave citation counts a powerful evaluative authority. They were transformed from factual footnotes into "rating" devices capable of legitimising decisions about hiring, funding, and research evaluation (Moed, 2005).

Yet Merton's normative sociology, despite its sophistication, rested on an assumption that would prove contentious: that citations generally operate within shared norms and values in science. From the late 1970s onwards, constructivist and Science and Technology Studies (STS) scholars challenged this view, arguing that citation practices cannot be reduced to norms or intellectual merit alone but are also shaped by contestation, rhetoric, and power. This shift redirected bibliometric inquiry from normative accounts of citation to more critical analyses of how scientific authority is constructed, negotiated, and contested.

2.1.3 Constructivist and STS Critiques

Scholars who emphasised power, conflict, and field dynamics later contested the Mertonian view of citations as normative acknowledgements. Bourdieu (1988), in particular, offered a structurally distinct alternative to Merton's normative account by conceptualising scientific recognition as a form of symbolic capital accumulated within fields structured by inequality and struggle. Bourdieu's perspective shifts attention towards the relational and competitive conditions under which recognition is produced: in his account, science constitutes a social field—a structured space in which agents compete for legitimacy and symbolic capital (Bourdieu, 1975, 2004). From this standpoint, citations can be understood as instruments in struggles over dominance, and scientific authority as produced through continuous contestation over resources, prestige, and recognition.

Bibliometric scholarship has drawn on Bourdieu's field-theoretical framework to reinterpret citations as indicators of, and resources in the accumulation of, symbolic capital. The value of citations depends not only on the act of referencing itself but also on the reputational status of the authors involved, the prestige of the journal, and the alignment of the work with dominant intellectual positions (Cronin, 2005; Gingras, 2016). Citations can function as active "position-taking" practices that signal allegiance, reinforce hierarchies, and help structure the distribution of symbolic authority. Article I in this thesis examines the reception and operationalisation of Bourdieu's (1989) structuralist constructivism in bibliometrics. Chapter 4 then systematically develops the Bourdieusian theoretical framework employed throughout the thesis.

In parallel, from the late 1970s into the early 1980s, constructivist critiques in STS challenged the foundational assumptions of citation theory. Collins, for instance, contributed to consolidating this broader shift by showing that scientific knowledge comes to count as such through processes of negotiation, interpretive flexibility, and community-based judgements of credibility rather than through norms and methods alone (Collins, 1983). These perspectives questioned whether citations reflect intellectual influence directly, arguing instead that they serve rhetorical, strategic, and perfunctory functions.

Nigel Gilbert (1977) highlighted the persuasive role of citations in scientific arguments, while Bruno Latour (1987) framed them as "inscription devices" that mobilise alliances and help scientific claims circulate. These scholars recast citations as rhetorical tools rather than transparent attributions of credit, revealing them as embedded in the production of scientific authority itself. Yet their emphases differ: Gilbert focuses on how citations function rhetorically within scientific texts to build arguments and convince audiences, while Latour emphasises the material and social work that citations perform in mobilising networks and circulating claims across time and space. Both challenge the assumption that citations transparently reflect intellectual merit.

Terttu Luukkonen (1997, p. 31) asked why Latour's theory was "largely ignored" by mainstream scholarship in the field. She argued that Latour's rhetorical interpretation reveals citations not just as markers of recognition, but as strategic tools used to legitimise contested knowledge claims (Latour, 1987; Latour & Woolgar, 2013). From a Latourian standpoint, citation counts cannot be treated as neutral indicators of value. By emphasising the diverse and often strategic uses of citations, Luukkonen showed that such indicators are methodologically fragile. Accepting Latour's account, she argued, would therefore require the field to move away from purely quantitative measurement towards more interpretive modes of

analysis—a move she saw as largely resisted. This methodological critique was reinforced by her empirical research, which showed that scientists frequently interpreted evaluations as instruments of legitimation rather than as drivers of behavioural change (Luukkonen, 1995).

Against this background, alternative lines of inquiry sought to operationalise a more explicitly interpretive and constructivist understanding of scientific knowledge production. Co-word analysis, developed within a constructivist, actor-network framework, maps the discursive structure of science by tracing conceptual networks in texts (Callon et al., 1991; Callon et al., 1983; Callon et al., 1986). This method reveals how knowledge emerges through shared terminologies and semantic alignments, charting science through its conceptual formations rather than through citation links alone.

Alongside these approaches, a second-order turn reframed bibliometric indicators and infrastructures as observation devices through which science describes—and thereby reshapes—itself.

2.1.4 Second-Order Bibliometrics: Citations as Communication

Emerging from constructivist critiques, later developments in bibliometric theory examined how citation practices not only reflect but also shape scientific culture. Paul Wouters (1999) developed the concept of "citation culture", arguing that referencing is not a transparent reflection of intellectual structure, but a socially embedded act shaped by disciplinary traditions, institutional constraints, and evaluation systems. Wouters described the Science Citation Index as a second-order observation device—a system that allows science to observe itself through indicators that are themselves performative. In this framework, citations do not merely describe science; they actively shape it by creating new forms of visibility and evaluation.

This reflexive approach marks a shift: whereas constructivist critiques expose how power and rhetoric enter citation practices, reflexive bibliometrics turns that lens back on bibliometrics itself as an object of inquiry. It emphasises the meaning-making aspects of citation practices and their cultural embeddedness, revealing how different disciplinary communities develop distinct citing conventions and interpretive frameworks. Wouters (2018) later extended this analysis through the "responsible metrics" agenda.

Yuko Fujigaki also conceptualised citation networks as dynamic systems that continuously reconstruct scientific knowledge (Fujigaki, 1998a, 1998b). She argued that citations act as "compasses" that position new research and recursively reshape the meaning of past work. Her model bridged qualitative accounts of science dynamics with quantitative analysis, offering a more integrated understanding of scientific evaluation.

Similarly, Loet Leydesdorff used a cybernetic standpoint and Niklas Luhmann's systems theory to model science as a self-organising communication system (Leydesdorff, 2001; Luhmann, 1995). In his view, citations are codified selections that stabilise meaning within recursive knowledge networks. His Triple Helix model captured the interactions between university, industry, and government. Although Wouters and Leydesdorff did collaborate (Leydesdorff & Wouters, 1999), their approaches differ: Leydesdorff used information-theoretic tools to formalise the dynamics of scientific communication, while Wouters focused on their policy implications and historical context.

Leydesdorff's (1989) assertion that co-word analysis offers a complementary method reflects this openness towards "qualitative scientometrics" (Callon et al., 1986). Unlike citation analysis, which primarily maps relational linkages between publications, co-word analysis traces patterns of term co-occurrence that may indicate underlying conceptual relationships and research themes (Callon et al., 1991; Callon et al., 1983). However, as Leydesdorff (2001) later demonstrates, such patterns do not provide a direct representation of cognitive structures, but instead reflect a combination of conceptual, linguistic, and rhetorical dimensions of scientific texts, and therefore require careful interpretation and multivariate analysis to disentangle these dimensions, rather than being read as direct mappings of knowledge structures.

The work of Wouters, Fujigaki, and Leydesdorff reflects a shift from instrumental to reflexive bibliometrics—a field capable of analysing its own effects and recognising the cultural dimensions of scholarly communication.

2.1.5 Synthesis: From Information to Performance

The evolution from Garfield's (1955) information-retrieval rationale to Wouters's (1999) reflexive paradigm marks a transformation in bibliometrics, from a descriptive method into a performative instrument of science governance. This entails a shift from viewing citations as objective traces of influence to seeing them

as tools that shape the structures they aim to map. In the wake of this shift, bibliometrics is understood as an arena in which scientific visibility is contested, negotiated, and reproduced. Contemporary research increasingly recognises the performative nature of indicators—their capacity to reshape the very phenomena they measure (Nelhans, 2022). In this sense, bibliometric indicators no longer merely describe science; they co-construct it by shaping—and being shaped by—the allocation of resources, reputations, and legitimacy (Nelhans, 2013). Accordingly, performativity operates at multiple scales—in national funding systems, institutional evaluation regimes, and researchers' publishing strategies—functioning as incentives that shape where scholars publish, what they prioritise, and which work becomes visible (de Rijcke et al., 2016; Hammarfelt & Rushforth, 2017).

The heterogeneous landscape of bibliometric indicators allows the same research activities to be assessed differently across evaluation models. This plurality underscores how bibliometric infrastructures are embedded in the governance of science, producing feedback loops between measurement practices and research behaviours.

The tension between instrumental and interpretive accounts of citation practices remains unresolved. In his work on *citationology*, Garfield (1998) argued that references constitute a specialised symbolic language with a citation syntax and grammar, and that citation indexes map the linkages between document addresses—addresses that may be described as *references* or *citations* depending on the direction of the link. On this view, citations function both as indicators of influence and as devices for intellectual mapping. Although citation-based methods are sometimes presented as scalable proxies for peer review (Donner et al., 2025), peer review remains the benchmark for quality because the meaning and significance of a citation are inherently context-dependent. Contemporary bibliometrics consequently seeks approaches that accommodate both the cognitive–informational functions and the socially embedded reputational logics of citation. As bibliometric evaluation has become a central mechanism of science governance, attention has turned to how indicators shape not only knowledge production but also opportunity, visibility, and recognition.

2.2 Critical Dimensions: Inequality and the Ethics of Bibliometrics

Bibliometric indicators do not merely observe scientific recognition; they participate in its production. As these methods have moved from information management tools to instruments of science governance, they have acquired performative force, shaping which contributions become visible, which researchers gain credibility, and which venues accumulate authority. This performative dimension raises critical questions. If bibliometric infrastructures govern access to recognition and resources, then the structural biases embedded in citation networks, journal hierarchies, and evaluation protocols are not merely methodological limitations but mechanisms through which inequality is reproduced. Such inequities become institutionalised through systems intended to measure scientific achievement.

Bibliometric literature has revealed that structural inequalities—particularly gendered and geopolitical biases—systematically privilege male, Western scholars in global science (Demeter & Toth, 2020; Halevi, 2019; Larivière et al., 2013; Mendonça et al., 2018), consolidating their status as dominant "cognitive authorities" (Wilson, 1983). This critical scholarship draws on the constructivist turn in science studies, which challenges assumptions about the neutrality of scientific knowledge production.

A central critique is the problematic equation of citations with research quality (Dahler-Larsen, 2019). The widespread use of indicators in evaluation has generated concern about their misuse, catalysing a "professional reform movement" that advocates for responsible metrics (Rushforth & Hammarfelt, 2023). The literature reviewed by de Rijcke et al. (2016) shows that once citations become evaluation tools, they help produce the very prestige they claim to measure, introducing a reflexive dynamic that complicates their use as neutral indicators. Such reflexive concerns are not new to the field. As discussed in Section 2.1, long before the emergence of responsible metrics, bibliometricians had already grappled with these tensions by integrating qualitative methods and sociological theory.

The reflexive turn in bibliometrics parallels broader shifts in the organisation of science itself, illuminating changing modalities of knowledge production. These transformations are articulated in *The new production of knowledge* (Gibbons et al., 1994), which distinguishes between "Mode 1" and "Mode 2" research. Mode 1 science is characterised by discipline-based, hierarchical structures focused on foundational principles and insulated within established academic boundaries. In

contrast, Mode 2 research is context-driven, problem-focused, and methodologically pluralistic, emerging "in the context of application" (Gibbons et al., 1994, p. 4). Knowledge production increasingly involves heterogeneous teams that cross disciplinary and institutional boundaries, engaging not only scientists but also governmental bodies, industries, and civil-society actors. In this context, bibliometric approaches have been proposed as a means of tracing patterns associated with Mode 2 knowledge production, particularly in interdisciplinary and transdisciplinary research domains (Kajikawa, 2022).

Concepts such as scientific trading (Leydesdorff et al., 1994; Rafols et al., 2010) treat citations as symbolic exchanges among disciplines, making it possible to map interdisciplinary flows of influence and legitimation empirically. Similarly, the notion of symbolic capitalism (Cronin, 2005; Gingras, 2010) reframes bibliometric indicators as instruments through which prestige, credibility, and authority circulate within an economy of reputation. Alternative metrics, including social-media-based indicators, diversify the currencies of recognition by foregrounding visibility and forms of social engagement alongside citation-based impact (Costas et al., 2017; Desrochers et al., 2018; Priem, 2014). These concepts collectively reframe bibliometric indicators as infrastructures through which symbolic capital circulates, rather than as technical measurement devices. Bibliometric infrastructures have, in this sense, become constitutive of the knowledge systems they purport to measure, actively structuring which collaborations form, which contributions gain legitimacy, and which hierarchies stabilise across disciplines and institutions. Understanding how such dynamics are articulated and stabilised through scholarly communication requires examining a field in which they are especially visible. Sustainability science is such a field—not because these dynamics are unique to it, but because its explicit commitments to interdisciplinary collaboration, societal relevance, and epistemic pluralism render them analytically prominent.

3. Sustainability Science

Sustainability science emerged in response to urgent challenges of global environmental change, social inequality, and economic development (Clark, 2007). The Brundtland Commission's report *Our common future* established the conceptual basis for the field by defining sustainable development as the process of reconciling present-day needs with the long-term interests of future generations (World Commission on Environment and Development, 1987). This framing repositioned sustainability from a technocratic concern to a fundamental rearticulation of societal goals across economic, social, and ecological dimensions, thereby demanding new integrative approaches to scientific inquiry. Building on this agenda, sustainability science has been articulated as a problem-defined field concerned with understanding interactions between nature and society while also advancing knowledge that is usable in practice (Clark, 2007; Kates et al., 2001).

The formation of sustainability science reflects a broader epistemological commitment to transformative change through mutual learning and stakeholder engagement (Clark & Harley, 2020; Lang et al., 2012; Spangenberg, 2011). Unlike traditional disciplines, it is explicitly problem-defined and oriented towards generating actionable knowledge that bridges theory and practice (Cash et al., 2003). This applied, use-inspired orientation has shaped both the field's intellectual development and its strategies for establishing credibility within academic institutions. From a bibliometric perspective, the consolidation of sustainability science as a recognisable community is relatively recent, shaped by rapid growth in publication output and by increasing cohesion in collaboration (co-authorship) networks (Bettencourt & Kaur, 2011).

These dynamics make terminological choices consequential. While the literature sometimes uses *sustainability science*, *sustainability research*, and *sustainability studies* interchangeably, this thesis treats them as analytical labels with different scopes and uses the distinctions to clarify what is being mapped and compared. *Sustainability research* refers broadly to scholarly work addressing environmental, social, and economic aspects of sustainability across disciplines and institutional contexts. *Sustainability science*, by contrast, designates a more recent, self-organised epistemic project integrating these strands into a coherent, problem-oriented field with explicit commitments to transdisciplinarity and societal relevance (Bettencourt & Kaur, 2011; Kates et al., 2001). As Bautista-Puig et al. (2021) emphasised, it remains a field in formation, oriented towards bridging science and society through collaborative, solution-focused inquiry.

The term *sustainability studies* is sometimes used—most notably by Wood (2011)—to describe broader educational and intellectual spaces, often rooted in the humanities or liberal arts. While several universities have adopted this label for academic programmes, it appears less consistently in bibliometric research. A notable exception is Ellili (2024), whose large-scale analysis employs *sustainability studies* as a field label, underscoring the ongoing terminological ambiguity surrounding this domain.

In this thesis, *sustainability science* is adopted as the primary analytical category. Bibliometric analysis requires identifiable institutional structures—such as dedicated journals, research centres, and professional societies—through which recognition and authority circulate. As the most widely operationalised term in bibliometric research (discussed in Section 3.3), *sustainability science* provides the clearest boundaries for tracing epistemic commitments, publication patterns, and mechanisms of authority. This strategic choice enables field-theoretical analysis without implying intellectual superiority over alternative framings.

Rather than tracing a comprehensive intellectual history, this chapter reconstructs sustainability science by examining its epistemic self-descriptions, institutional trajectories, and bibliometric mapping. By analysing the field's self-understanding as a form of strategic positioning within academic and policy arenas, this chapter establishes the empirical basis for the field-theoretical framework developed in Chapter 4.

3.1 Epistemic Reorientation, Post-Normal Science, and Methodological Pluralism

The epistemological self-understanding of sustainability science rests on a fundamental reorientation of scientific practice. Conventional models of normal science—emphasising predictive certainty, objectivity, and disciplinary reductionism—are widely regarded as inadequate for addressing sustainability's "wicked problems", characterised by deep uncertainty, contested values, high stakes, and urgent decision-making (Gold et al., 2018; Kerekes, 2023; Ravetz, 2018). These conditions strain disciplinary specialisation and undermine the assumption that complex socio-ecological systems can be governed through linear prediction and technical optimisation alone.

Post-normal science (PNS), as developed by Funtowicz and Ravetz (1993), provides a widely used vocabulary for this reorientation. PNS designates situations

in which “facts are uncertain, values in dispute, stakes high, and decisions urgent” (Funtowicz & Ravetz, 1993, p. 744). Sustainability challenges in environmental governance often exemplify these conditions, and sustainability science is frequently situated in contexts where these post-normal conditions complicate conventional quality assurance (Ravetz, 1999). Building on this, Ravetz (2006) links PNS directly to sustainable development, suggesting that the complexity and value-laden character of sustainability problems call for alternative criteria of scientific quality and legitimacy.

One implication of post-normal science is a rethinking of how quality is secured. Rather than seeking definitive certainty, PNS emphasises robustness, reflexivity, and transparency—qualities that cannot be secured through conventional peer review alone, but require deliberation and scrutiny within extended peer communities (Ravetz, 2006). These communities incorporate practitioners, policymakers, civil society actors, and Indigenous groups alongside academic researchers, positioning participatory knowledge production as integral to scientific rigour rather than a departure from it. The precautionary principle—understood as a commitment to early action in the face of uncertainty and potential irreversibility—complements this orientation by emphasising resilience-building and adaptive governance rather than delaying intervention until definitive predictions are available (Clark & Harley, 2020; Ravetz, 2022).

At the same time, participation within extended peer communities is structured by unequal authority. Academic credentials, institutional affiliation, and access to technical language shape whose contributions are recognised as legitimate, revealing tensions between epistemic inclusion and entrenched hierarchies. As Ravetz (2006) himself acknowledged, many of the participatory and reflexive ideals associated with post-normal science remain aspirational rather than fully institutionalised—a gap that is particularly salient in sustainability science.

Post-normal science should therefore be understood not as a comprehensive framework but as one influential component of a broader epistemic repertoire. In programmatic texts and field-defining statements, sustainability science draws on multiple epistemic resources to articulate its distinctiveness: problem-driven inquiry, integration of diverse knowledge systems, commitment to transdisciplinarity, and the production of actionable knowledge (Clark & Harley, 2020; Lang et al., 2012). These resources do not merely describe scientific practice; they actively shape it by structuring which questions are prioritised, who is recognised as credible, and how expertise is evaluated. As Nagatsu et al. (2020) emphasised,

the justification of epistemic norms in sustainability science is inherently political, raising questions about who defines standards of credibility and on what grounds.

This plural epistemic orientation is reflected in sustainability science's methodological diversity. The field integrates quantitative modelling, scenario analysis, and network approaches with participatory and transdisciplinary methods that emphasise joint problem framing, collaborative knowledge production, and iterative learning (Cash et al., 2003; Lang et al., 2012). While such methodological pluralism enables engagement with complex socio-ecological systems, it also complicates efforts to establish unified standards of evaluation and quality assurance.

Beyond post-normal science, sustainability science incorporates normative and conceptual frameworks that further expand its epistemic range. Enduring debates over the meaning of sustainability itself—most notably the distinction between weak sustainability, which allows substitution between natural and other forms of capital, and strong sustainability, which emphasises the irreplaceability of critical natural capital—encapsulate deeper philosophical disagreements about human–nature relationships and obligations towards future generations (Neumayer, 2003; Wilson & Wu, 2016). These positions shape how sustainability problems are framed, which forms of knowledge are considered relevant, and what kinds of interventions are deemed legitimate.

Closely related conceptual frameworks, such as resilience and Anthropocene thinking, further structure sustainability science's epistemic orientation. Resilience conceptualises socio-ecological systems in terms of their capacity to absorb disturbance while maintaining core functions, foregrounding adaptability, nonlinearity, and transformation (Folke, 2006). Anthropocene thinking emphasises the scale, acceleration, and potential irreversibility of human impacts on Earth systems, reinforcing claims that contemporary sustainability challenges exceed the scope of conventional disciplinary science (Steffen et al., 2011). These are two prominent examples drawn from the conceptual repertoire through which sustainability science articulates the urgency of its agenda and the rationale for methodological pluralism. As Clark and Harley (2020) argue, questions of what counts as relevant knowledge, which societal goals should be prioritised, and how trade-offs are evaluated cannot be separated from scientific inquiry itself. Normative reflexivity thus becomes a constitutive feature of the field's epistemic identity, reinforcing a move towards plural standards of rigour and legitimacy.

3.2 Institutionalisation and the Formation of Field Identity

While sustainability science's epistemic orientation emphasises pluralism, reflexivity, and transdisciplinarity, its consolidation as a scholarly domain depends on institutional processes that stabilise, reward, and reproduce particular forms of knowledge. Sustainability science was established as a response to urgent and complex challenges—such as climate change mitigation, biodiversity conservation, and environmental justice—and underpinned by claims that participatory and adaptive approaches are necessary under conditions of uncertainty and contested values. These justifications support the field's claim to autonomous institutional space, including dedicated journals, research centres, degree programmes, and professional societies, rather than remaining subsumed within established disciplines such as environmental science or ecology (Yarime et al., 2012).

Institutionalisation is not merely a process of stabilisation but a process through which scientific authority and reputational control are selectively distributed (Whitley, 2000). The creation of journals, research centres, and professional associations establishes formal sites of recognition that privilege certain research agendas, methods, and problem framings while marginalising others. Understanding how sustainability science has achieved institutional standing therefore requires examining not only which intellectual programmes have succeeded, but also how recognition and resources become concentrated within particular organisational configurations.

In the literature, the rise of sustainability science is frequently interpreted as part of broader transformations in scientific practice and institutional organisation associated with changing societal expectations and modes of knowledge production (Cash et al., 2003; Gibbons et al., 1994). These transformations enable interdisciplinary and transdisciplinary work while simultaneously embedding such work within established academic evaluation structures.

This tension becomes particularly visible in sustainability science's institutional development. The field's integration of perspectives from the natural sciences, the social sciences, the humanities, and Indigenous knowledge systems reflects both intellectual ambition and strategic positioning, as institutional credibility depends on demonstrating the capacity to transcend disciplinary boundaries while remaining legible to evaluation regimes rooted in disciplinary standards.

Field identity is further shaped by internal differentiation. As Clark and Harley (2020) emphasised, sustainability science comprises multiple research programmes, schools of thought, and specialised domains, each characterised by distinct terminologies, conceptual frameworks, and methodological preferences. While interdisciplinary initiatives have driven much of the field's growth, integration remains partial. Fragmentation reflects not merely intellectual pluralism but, following Whitley (2000), struggles over influence within field formation: research programmes embedded in more powerful organisational and reputational structures are better positioned to shape discourse priorities, attract resources, and define what counts as legitimate sustainability science.

Sustainability science exhibits many characteristics associated with Mode 2 knowledge production—context-driven, transdisciplinary research conducted within established academic institutions (Gibbons et al., 1994; Wiek et al., 2012). This dual positioning generates persistent tensions between rigour and relevance, as well as between disciplinary depth and transdisciplinary breadth. These tensions are mediated through concrete institutional mechanisms (Whitley, 2000). Journal editorial boards, for instance, act as gatekeepers by privileging particular methods and problem framings. Funding agencies develop research agendas by issuing strategic calls designed to promote specific types of collaboration and measurable impact. Doctoral training programmes reproduce epistemic norms by socialising early-career researchers into methodological and theoretical traditions. University tenure and promotion criteria translate field-level dynamics into individual career incentives, rewarding specific forms of scholarship.

External actors, such as policymakers and funding bodies, exert significant influence over research priorities, often directing attention towards actionable, near-term solutions for urgent problems such as climate change mitigation (Guston, 2001; Leydesdorff, 1997). While such responsiveness enhances societal relevance, it also introduces risks to epistemic autonomy.

These institutional dynamics position sustainability science as a Mode 2–type field, in which epistemic pluralism, normative reflexivity, and transdisciplinarity are continuously negotiated within organisational and evaluative structures.

3.3 Mapping the Field: Bibliometric Perspectives on Sustainability Science

The emergence of sustainability science reflects how scientific fields consolidate intellectual authority. As Sugimoto and Weingart (2015) highlighted, accounts of field formation often rely on narrative histories that foreground pivotal figures, landmark conferences, foundational journals, and forms of institutional recognition. In sustainability science, for instance, one prominent origin story invokes the Brundtland Commission's *Our common future* as a foundational reference point (World Commission on Environment and Development, 1987). At the same time, the field's institutional consolidation occurred later and drew on multiple antecedents. Sustainability science also exemplifies what Sugimoto and Weingart (2015) term a Zeitgeist-born field, emerging in response to urgent global concerns such as climate change and social inequality (Burger et al., 2012). Yet its consolidation has involved complex processes of resource mobilisation and struggles over epistemic authority that extend beyond these founding narratives.

Bibliometric research has played a role in documenting—and in important respects helping to constitute—sustainability science's consolidation. By establishing categories, identifying core journals, and mapping citation networks, bibliometric studies do not merely observe the field's structure; they actively participate in defining its boundaries and hierarchies. Classification itself is constitutive of field formation. Deciding which journals count as "sustainability science", which citations indicate "field coherence", and which collaboration patterns signal "interdisciplinary integration" stabilises particular understandings of the field and renders them actionable. This reflexive dimension—that classifications may help construct the field they purport to analyse—often remains implicit, yet is central to how scientific authority becomes institutionalised. The following studies illustrate how such classificatory choices have been operationalised in empirical mappings of sustainability science.

Kajikawa and colleagues' series of studies mapped the field's thematic clusters and their fragmentation, proposed conceptual frameworks, tracked emerging thematic hubs (including socio-technical transitions), and examined how specific journals contributed to field coherence (Kajikawa, 2008; Kajikawa et al., 2007; Kajikawa et al., 2017; Kajikawa et al., 2014). This body of work highlights the role of editorial decisions, funding dynamics, and institutional affiliations in shaping cohesion within the field. Bettencourt and Kaur (2011) offer a complementary macro-scale perspective, arguing that sustainability science underwent a "phase transition" around 2000, when previously fragmented communities formed a

dense global collaboration network—interpreted as evidence of increasing interdisciplinary consolidation.

Subsequent studies have refined and extended these insights. For instance, Bautista-Puig et al. (2021) introduced a journal-level taxonomy based on citation flows, using the Green and Sustainable Science and Technology category of Web of Science. Their classification—dividing journals into specialised, importer, exporter, and interdisciplinary types—revealed that the field remains dominated by specialised and multidisciplinary outlets, while integrative venues, though fewer, show greater longitudinal stability.

In a complementary approach, Buter and Van Raan (2013) identified a Highly Cited Knowledge Base (HCKB)—that is, a set of highly cited publications taken to constitute sustainability science's core literature. This corpus showed a strong emphasis on environmental and economic themes, with comparatively limited representation of social dimensions. Such an imbalance complicates the field's claims to balanced interdisciplinarity and inclusivity.

Further studies have highlighted conceptual and geographical heterogeneity. Vanhulst and Zaccai (2016) demonstrated that Latin American traditions foreground social justice and Indigenous knowledge more than dominant Global North frameworks, while Geissdoerfer et al. (2017) identified tensions between sustainability and circular economy framings, especially in relation to economic efficiency narratives. These insights reveal that interdisciplinarity is not merely a technical achievement, but a contested and uneven process shaped by global knowledge hierarchies.

Adding a more contemporary, large-scale perspective, Ellili (2024) conducted a bibliometric analysis of over 20,000 Scopus-indexed documents from 2000 to 2022. The study confirmed continued growth in the field and the persistent dominance of environmental over social themes. Ellili also employed the label "sustainability studies" in the analysis, adding further terminological ambiguity to the evolving discourse.

Kassab et al. (2020) found little correlation between altmetrics and expert assessments of societal relevance, highlighting challenges in quantifying impact for mission-oriented fields, while Liu et al. (2021) used topic modelling to identify emerging research frontiers, exemplifying how bibliometric methods shape visibility of certain knowledge trajectories through their classificatory frameworks.

Across this literature, several patterns recur: (1) a persistent thematic imbalance favouring environmental and economic dimensions over social concerns (Buter

& Van Raan, 2013; Ellili, 2024); (2) geographic concentration in the Global North (Ellili, 2024; Vanhulst & Zaccai, 2016); (3) journal hierarchies dominated by specialised venues alongside fewer but more stable integrative outlets (Bautista-Puig et al., 2021); and (4) marked stratification in citation patterns (Bettencourt & Kaur, 2011; Kajikawa et al., 2017). Several of these patterns are examined empirically in the articles comprising this thesis, though through different datasets, analytical lenses, and levels of aggregation.

These bibliometric studies effectively document recurring structural patterns—such as thematic evolution, citation flows, collaborative networks, and journal hierarchies—yet bibliometric mappings are typically better suited to describing such regularities than to specifying the mechanisms that generate them. They render visible what is captured in publication records, but offer more limited leverage for explaining why certain research programmes accumulate disproportionate recognition, how journal hierarchies become naturalised, or through which processes epistemic authority is conferred and contested.

3.4 From Epistemic Dynamics to Symbolic Power

Bibliometric research is well suited to revealing stratification in publications, journals, and collaboration networks, but less well suited, on its own, to explaining how authority, credibility, and recognition become stabilised within a field. This requires examining not only which research programmes, venues, or actors achieve prominence, but how such prominence is produced and naturalised through institutional arrangements. From this perspective, patterns of recognition are not simply outcomes of intellectual merit, but are shaped by structured processes of evaluation, gatekeeping, and resource allocation. Scientific fields are arenas of struggle in which actors compete over symbolic power, evaluative authority, and control over the criteria of legitimacy (Bourdieu, 2004). Hierarchies of recognition are therefore inseparable from the institutional conditions through which they are generated and reproduced.

Chapter 4 establishes a theoretical framework that integrates a reflexive approach to bibliometrics with field theory to address this gap. Where bibliometric methods identify patterned distributions of visibility and recognition, field theory provides conceptual tools for analysing how these distributions emerge, persist, and acquire legitimacy over time. Bringing these approaches together makes it possible

to understand the consolidation of sustainability science as a social process through which epistemic authority becomes institutionalised.

4. Theoretical Framework

Sustainability science is examined here as an emerging field—a contested social space in which authority, legitimacy, and evaluative criteria are continuously produced. I analyse this emergence through Pierre Bourdieu's theory of fields, which conceptualises science as a structured arena of struggle over the accumulation and conversion of capital, and over the power to define what counts as valid knowledge (Bourdieu, 2000). Rather than displacing cognitive accounts of disciplinary development, this approach operates at a different analytical level: it specifies how recognition is organised, how evaluation systems stabilise epistemic authority through means beyond intellectual content alone.

The present study traces how recognition and gatekeeping operate through journals, citation patterns, editorial discourse, and board-level governance. Such analysis requires an explicit account of how symbolic capital becomes recursively embedded (through self-reinforcing feedback) in institutions, rather than treating institutionalisation as an endpoint. For that purpose, I introduce the Symbolic Capital Institutionalisation Model (SCIM): a process-oriented synthesis that organises Bourdieusian concepts into an analytic sequence distinguishing pre-institutional emergence from post-institutional reproduction. SCIM was developed through the empirical investigations that inform this thesis.

I do not claim orthodoxy in my application of Bourdieu. As Seldén writes—referring to the different context of adapting Bourdieu's work to information-seeking research—there is "no intended heresy in the constructions, but there is no promise of orthodoxy either" (Seldén, 2004, p. 279). I proceed in that spirit, drawing on Bourdieu's relational sociology while integrating Frickel and Gross's (2005) theory of scientific/intellectual movements to better account for how heterodox fields emerge and institutionalise.

This chapter establishes a field-theoretical framework for analysing how epistemic authority and recognition are produced, stabilised, and reproduced in sustainability science. It first situates Bourdieu's theory of scientific fields in relation to systems theory and science and technology studies. It then establishes reflexivity as a methodological requirement for studying evaluative infrastructures—such as bibliometric indicators—that are themselves part of the field under analysis. Building on this foundation, the chapter reconstructs key Bourdieusian concepts as mechanisms of recognition, consecration, and reproduction, culminating in SCIM.

4.1 Field Theory and Its Distinctive Contribution

Bourdieu's (1975) field theory conceptualises science as a competitive, relational space structured by unequal distributions of capital—economic, cultural, social, and symbolic. In this view, scientific consensus is not a neutral starting point but an outcome of struggles over recognition and the authority to define legitimate knowledge. Scientists' roles are shaped by their access to resources, with recognition centralised through journals, citation networks, and affiliations. The field is thus not a neutral backdrop but a generative structure that shapes which contributions are recognised, which methods are legitimated, and which venues are treated as authoritative (Bourdieu, 2000). Field theory provides tools for analysing how such fields negotiate legitimacy through the accumulation and conversion of capital, and through struggles over who holds the authority to define valid research. These dynamics are central to the empirical studies in this thesis, which examine how sustainability science's authority is mediated through journal hierarchies, citation-based recognition, editorial discourse, and the gatekeeping practices of editorial boards.

The term *gatekeeping* is used throughout this thesis in a structural sense derived from Bourdieu's field theory, referring to the positional authority through which access to recognition and legitimate field membership is regulated. Bourdieu himself employs the term *gatekeepers* to describe agents who guard the boundaries of fields of cultural production, controlling what is admitted and what is excluded (Bourdieu, 2020, p. 296). This structural–positional understanding differs from the processual model of gatekeeping developed within media and communication studies (Shoemaker & Vos, 2009), which focuses on how information is selected, rejected, or transformed as it passes through decision points in communication channels (for a discussion from an informetric perspective, see also Gunnarsson Lorentzen, 2016). Rather than analysing selection as a sequence of decisions, the present study examines how the capacity to perform such selections is itself unequally distributed and institutionally stabilised—focusing on the distribution and concentration of gatekeeping positions through which recognition and legitimacy are differentially allocated.

While field theory provides a structured account of scientific authority and hierarchy, it is one of several approaches to understanding how knowledge production is organised. Systems theory and science and technology studies (STS)—particularly Actor–Network Theory (ANT)—offer influential alternatives that illuminate important dimensions of scientific practice. However, they offer less explanatory leverage for understanding how hierarchies of credibility and

institutionalised authority are produced and reproduced over time—especially in fields whose epistemic and normative commitments unsettle established disciplinary criteria.

ANT, a dominant current within STS, focuses on how knowledge is assembled through networks of human and nonhuman actors (Callon et al., 1986; Latour, 2005). Its commitment to generalised symmetry and contingency provides valuable tools for tracing how facts are stabilised in practice (Sismondo, 2011). Yet this same orientation can make enduring structural differences harder to capture. ANT is therefore less well equipped to explain how credibility becomes concentrated, how institutional authority persists and consolidates over time, or how evaluative mechanisms become self-reproducing. Following actors through networks can illuminate local negotiations, while leaving the durability of the constraints that structure those negotiations comparatively underspecified.

Systems-theoretical approaches, especially Luhmann's formulation, conceptualise science as a functionally differentiated subsystem governed by the binary code of true/false (Luhmann, 1995). This approach provides rigorous models of the recursive nature of scientific communication and differentiation (Leydesdorff, 2021), but it offers a thinner account of stratification: why some actors and institutions can impose definitions of quality more effectively than others remains analytically secondary. The question of who defines what counts as true—and through what mechanisms such definitions become durable—falls outside the framework's explanatory scope.

Bourdieu's field theory views science as a structured arena of competition in which actors struggle over symbolic capital and access to consecrating institutions such as journals, editorial boards, and citation systems (Bourdieu, 2000). The theory acknowledges contingency and heterogeneity while specifying the processes through which hierarchies are produced and reproduced. It also provides analytical traction for a phenomenon central to this thesis: how fields that articulate heterodox commitments to transformation nonetheless reproduce orthodox structures of recognition—the transformation paradox that characterises sustainability science's institutionalisation.

At the same time, field theory's emphasis on structural reproduction can understate the role of collective action, innovation, and contestation in scientific change. Frickel and Gross (2005) propose a general theory of scientific/intellectual movements to account for the emergence of organised, purposive groups that challenge dominant paradigms and reshape field structures from within. This per-

spective complements rather than contradicts field theory by specifying the agentic mechanisms through which heterodox actors gain footholds, while field theory explains why such mobilisation tends to generate new hierarchies even as it challenges existing ones. SCIM, developed in Section 4.9, integrates these perspectives by distinguishing two phases of field development: it draws on the scientific/intellectual movements literature to theorise pre-institutional emergence and mobilisation, and applies field-theoretic mechanisms to explain how consecration becomes self-referential once institutionalisation thresholds are crossed. This process operates across multiple analytical levels. Micro-level decisions—such as where to submit, whom to cite, or whom to collaborate with—aggregate into meso-level patterns, including journal hierarchies, peer-review norms, and editorial gatekeeping, which in turn stabilise macro-level structures of recognition and inequality. The empirical studies in this thesis draw on such traces—citations, journals, editorial texts, and editorial board structures—to reconstruct how authority is organised in sustainability science.

4.2 Reflexivity as Epistemic Foundation

Bourdieu's (1988, 2004) reflexive sociology insists that scholarly analysis must systematically examine how its own categories, methods, and evaluative tools are shaped by the same power relations they seek to explain. Reflexivity is therefore an epistemic requirement for studying scientific fields. This requirement is particularly salient in research that relies on evaluative and classificatory instruments such as citations, journal rankings, and bibliometric indicators, which are themselves structured by hierarchical relations (Cronin, 2005; Hammarfelt & Rushforth, 2017; Wouters, 1999). A reflexive stance guards against the naturalisation of these hierarchies—particularly the distinctions stabilised through evaluative and classificatory infrastructures. Apparent merit-based differentiation may reflect accumulated structural advantages rather than intrinsic differences in epistemic contribution. Ostensibly neutral indicators, meanwhile, can embed historically contingent evaluative norms and institutional priorities rather than universal ones (Dahler-Larsen, 2019). Treating bibliometric indicators as objects of analysis rather than transparent measures makes it possible to examine how evaluative infrastructures actively shape the distribution of recognition within a field (de Rijcke et al., 2016).

In this thesis, reflexivity functions as a conceptual bridge between empirical mapping and theoretical explanation. It ensures that bibliometric patterns—such as

citation stratification, journal hierarchies, and concentration of visibility—are interpreted not as direct reflections of epistemic quality but as outcomes of social processes through which authority is produced and stabilised.

4.3 Capital, Conversion, and Hierarchy in Scientific Fields

Unequal distributions of capital organise scientific fields, influencing individuals' positions and their potential to gain recognition (Bourdieu, 1986). Economic capital refers to resources such as funding, infrastructure, and equipment. Cultural capital exists in embodied (methodological competencies, theoretical expertise), objectified (books, datasets, instruments), and institutionalised (credentials, titles) forms (Bourdieu, 2020). Social capital consists of networks that provide access to resources and recognition, with value dependent on the volume and composition of capital held by one's connections. Symbolic capital refers to resources such as prestige, which are perceived as inherent attributes of individuals or institutions, though they actually arise from relational social structures (Bourdieu, 1979).

Within scientific fields, symbolic capital occupies a privileged position (Bourdieu, 1975). It functions as the primary medium through which other forms of capital acquire efficacy. Economic resources enable research, but without symbolic recognition, findings may remain marginal. Cultural competencies equip scholars with skills and expertise, yet these do not necessarily translate into authority without recognition by established evaluative institutions. What distinguishes scientific fields from domains where economic or political power operates more directly is precisely this requirement that recognition be symbolically mediated.

Bourdieu (1975, 2004) uses the term *scientific capital* to designate the field-specific form of symbolic capital operating within science—the authority and credibility derived from peer recognition, citation visibility, editorial influence, and institutional prestige. This thesis, however, retains the broader term *symbolic capital* for two reasons. First, the concept of symbolic capital more directly captures the focus on recognition, consecration, and prestige that structures the empirical analyses presented here. Second, and more importantly, this thesis develops the concept of *objectified symbolic capital*—capital materialised in durable institutional forms such as journals and editorial structures (see Section 4.8).

The conversion of capital follows field-specific logics shaped by historical struggles over legitimate practice (Bourdieu, 1975). In relatively autonomous scientific fields, economic capital converts into symbolic capital only through extended processes of peer review, publication, and evaluation. In more heteronomous contexts, external resources may translate more directly into recognition. These exchange rates are not fixed: bibliometric evaluation has altered how publication volume converts into symbolic recognition (de Rijcke et al., 2016), while international collaboration has reshaped how social capital translates into research opportunities (Leydesdorff & Wagner, 2008).

4.4 Mechanisms of Consecration and Recognition

Consecration is a fundamental mechanism through which symbolic capital is generated and distributed within scientific fields (Bourdieu, 1993, pp. 55–61; 2008). It encompasses the ensemble of practices through which certain contributions are marked as valuable—peer-review judgements, citation decisions, editorial selections, awards, and academic appointments. Each act of consecration derives its efficacy not from intrinsic authority, but from the accumulated symbolic capital of the agents or institutions that perform it.

This reveals consecration's recursive structure: effective acts of consecration presuppose prior consecration. Prestigious journals confer value on manuscripts because they have themselves been consecrated through long histories of selective publication and citation accumulation. Established scholars consecrate junior researchers because they possess recognised authority that can be transferred. This circularity helps explain how hierarchies of recognition stabilise and reproduce themselves over time.

Processes of consecration unfold across distinct temporal cycles (Bourdieu, 1985; Bourdieu et al., 1991). Some forms of recognition are fleeting, whereas others accumulate over longer periods, becoming durable and, in some cases, canonical. These temporal dynamics vary across fields: rapidly evolving domains compress cycles of recognition, whereas more stable fields may require decades for consecration to take hold.

Central to consecration's effectiveness is *misrecognition*—the collective forgetting of the social conditions through which symbolic capital is produced (Bourdieu, 1991a). Prestige comes to appear as an intrinsic property of the work itself rather than as an effect of the journal's accumulated symbolic capital. Recognition is thus experienced as the outcome of individual merit rather than as the product

of structurally unequal positions within the field. This misrecognition is not a cognitive error but a practical belief embedded in *habitus*—the system of durable dispositions through which agents perceive, evaluate, and act within the field (Bourdieu, 2020). Through habitus, researchers genuinely experience consecrated work as valuable even as the social mechanisms producing that value remain obscured.

4.5 The Structures of Reproduction

Agents reproduce scientific fields through *illusio*—the embodied belief that the field's stakes are worth pursuing (Bourdieu, 1990, 1998). Publication, citation, and recognition come to matter not primarily through rational calculation but through prolonged immersion in academic practice. This investment varies systematically by position: dominant agents, whose careers have been shaped by existing rules, tend to exhibit strong illusio and a stake in preserving field structures; marginal agents may perceive the game's arbitrariness more clearly, yet remain bound by the practical necessity of playing it.

Beneath explicit rules and evaluative criteria lies *doxa*—the taken-for-granted assumptions that structure perception and practice within the field (Bourdieu, 1977, 2000). Doxa defines what is self-evident and beyond justification, including accepted standards of rigour, implicit hierarchies of worth, and naturalised disciplinary boundaries. Under conditions of doxa, what counts as "good science" is rarely debated at the level of first principles—evaluative criteria such as journal prestige or citation impact may function as self-evident measures of quality rather than as conventions open to contestation.

When fields undergo rapid transformation—through technological change, institutional reform, or shifts in evaluation regimes—a temporal mismatch can emerge between actors' dispositions and new conditions of practice. Bourdieu terms this *hysteresis* (Bourdieu, 1977, 2000). Such lags generate both tension and opportunity, as established actors may experience capital devaluation while newer entrants align more readily with emerging structures. Bourdieu's (1988) analysis of French higher education around May 1968 illustrates this dynamic, showing how established academics experienced a devaluation of their accumulated capital as the institutional conditions of the field shifted abruptly.

Field reproduction ultimately depends on *symbolic power*—a form of domination operating through the tacit consent of those subject to it (Bourdieu, 1989, 1991a).

Through repeated exposure to field hierarchies, actors acquire dispositions attuned to their positions, learning to recognise prestige as legitimate and excellence as naturally associated with dominant institutions. Symbolic power manifests in deference to elite venues, anticipatory self-censorship that discourages submission to high-status journals, and the tendency to interpret rejection as personal inadequacy rather than as an effect of structural asymmetries embedded in field positions.

4.6 Struggles for Transformation: Heterodoxy and Heresy

Even within reproductive dynamics, scientific fields retain space for transformation through the dialectic of *orthodoxy* and *heterodoxy* (Bourdieu, 1977; Bourdieu, 1993). Orthodoxy denotes the dominant vision of the field: established classifications, recognised methodologies, and accepted evaluative frameworks sustained through institutional power and doxic assumptions. Heterodoxy, by contrast, comprises positions and discourses that explicitly challenge these principles, rendering visible what orthodoxy treats as self-evident and proposing alternative definitions of legitimate knowledge and authority.

Such struggles are structured by the unequal distribution of capital. Agents with limited standing often perceive the field's arbitrariness more clearly but lack the symbolic capital required to make heterodox alternatives credible. Conversely, agents occupying dominant positions possess the authority to define legitimacy but are strongly invested in preserving existing arrangements. Dissenting challenges tend to be most effective when advanced by actors at the intersection of inclusion and marginality—those who have accumulated enough capital to be taken seriously, while remaining sufficiently distant from the centre of power to question its foundations (Bourdieu, 1988; Frickel & Gross, 2005).

These struggles are enacted through differentiated strategies that reflect agents' positions within the field. *Conservation strategies*, typically deployed by capital-rich agents, aim to preserve existing hierarchies by defending dominant methodologies, reinforcing disciplinary boundaries, and maintaining established journal and evaluation hierarchies. *Subversion strategies*, more often adopted by challengers seeking upward mobility or field redefinition, contest these hierarchies by promoting alternative methods, legitimating new objects of inquiry, founding new venues, or proposing novel evaluative criteria (Bourdieu, 1993). Such strategies

do not operate outside the field's logic but seek to transform it from within by reshaping the criteria through which legitimacy is allocated.

When heterodox strategies become coordinated and collectively sustained, they take on a movement-like character. From the perspective of *scientific/intellectual movements*, field transformation is understood less as a purely cognitive rupture than as an organised process of contestation and institutional construction (Frickel & Gross, 2005). Unlike Kuhnian paradigm shifts, which emphasise theoretical replacement within established disciplinary frameworks (Kuhn, 1970), this perspective foregrounds collective mobilisation, struggles over recognition, and the creation of alternative infrastructures of publication, evaluation, and training. New fields emerge not solely through epistemic innovation, but through sustained efforts to stabilise heterodox claims by translating them into durable institutional forms.

4.7 The Autonomy–Heteronomy Axis

Scientific fields exist in tension between *autonomous* and *heteronomous* principles of hierarchisation (Bourdieu, 2004). The autonomous principle derives from internal criteria of valuation—peer recognition, disciplinary standards, and theoretical or methodological sophistication (Bourdieu, 1993, 1996). The heteronomous principle reflects external forces, including political priorities, economic demands, policy relevance, and media visibility. Every scientific field occupies a position along this autonomy–heteronomy axis, which shapes how capital circulates and how recognition is allocated.

In relatively autonomous fields, symbolic capital accumulates primarily through peer-validated achievement. Whitley (2000) offers a complementary account, arguing that scientific work depends on relations of mutual dependency among scientists in the conduct and evaluation of research. Publication venues are hierarchised by disciplinary prestige, careers advance through recognition by colleagues, and research trajectories follow largely internal intellectual logics. In more heteronomous fields, symbolic capital is negotiated across multiple valuation regimes. External funding, demonstrable societal impact, or policy influence may function as sources of recognition, while media visibility or stakeholder relevance can partially substitute for peer consecration.

A field's position on the autonomy–heteronomy axis conditions the conversion of capital. Autonomous fields regulate conversion through peer-controlled mechanisms, whereas heteronomous fields allow a more direct translation of external

resources into symbolic recognition. This generates strategic dilemmas for researchers: publicly accessible or policy-oriented outputs may enhance heteronomous standing while diminishing autonomous prestige; theoretical sophistication may strengthen peer recognition while limiting funding opportunities; engagement with external stakeholders may increase visibility at the cost of disciplinary authority.

These dynamics also shape how symbolic capital becomes institutionalised. In autonomous fields, authority concentrates in peer-controlled structures such as editorial boards, learned societies, and professional associations. In heteronomous fields, external actors exert greater influence through funding priorities, evaluation frameworks, and governance regimes. Editorial boards constitute a central site where this gatekeeping function becomes visible, as symbolic authority is exercised and negotiated at the intersection of autonomous and heteronomous principles of valuation—a dynamic examined empirically in Article IV of this thesis.

4.8 Objectified Symbolic Capital

Symbolic capital attains its most durable form when it becomes objectified—that is, embedded in institutional infrastructures that outlast individual careers and short-term struggles for recognition (Bourdieu, 1986, 1988). Prestige sediments into relatively stable entities such as journals, departments, professional associations, ranking systems, and evaluation platforms. Once objectified, symbolic capital no longer depends on the continuous presence or performance of particular actors, but persists through institutional continuity.

Prestigious journals provide a paradigmatic example. Their authority is not reducible to the merit of any single publication; it derives instead from standing accumulated through editorial selectivity, citation density, and disciplinary centrality. This symbolic capital becomes available to subsequent contributors, who benefit from the journal's status even if they did not contribute to building it. Similar dynamics operate in elite departments and research centres, where reputational advantages are transmitted across cohorts through institutional affiliation rather than recreated anew by each generation.

Objectified symbolic capital exhibits strong path dependence. Institutions that already command recognition tend to attract submissions, citations, funding, and highly qualified researchers, reinforcing their position through cumulative and self-amplifying dynamics. These dynamics of cumulative advantage constitute

the Matthew effect, discussed in Section 2.1.2 (Merton, 1968, 1988). Conversely, newer journals and organisations face structural barriers to recognition: they must accumulate symbolic capital gradually through sustained selectivity and visibility, while competing against established actors whose advantages compound over time.

While scholars can often benefit relatively quickly from affiliation with consecrated institutions, the contribution of any single individual to an institution's overall symbolic capital is typically limited. Objectified symbolic capital therefore shapes researchers' strategic options—where to publish, whom to collaborate with, and which affiliations to pursue—by concentrating symbolic capital in already-consecrated institutions and venues. This orientation reflects practical adaptation to the field's structured distribution of recognition.

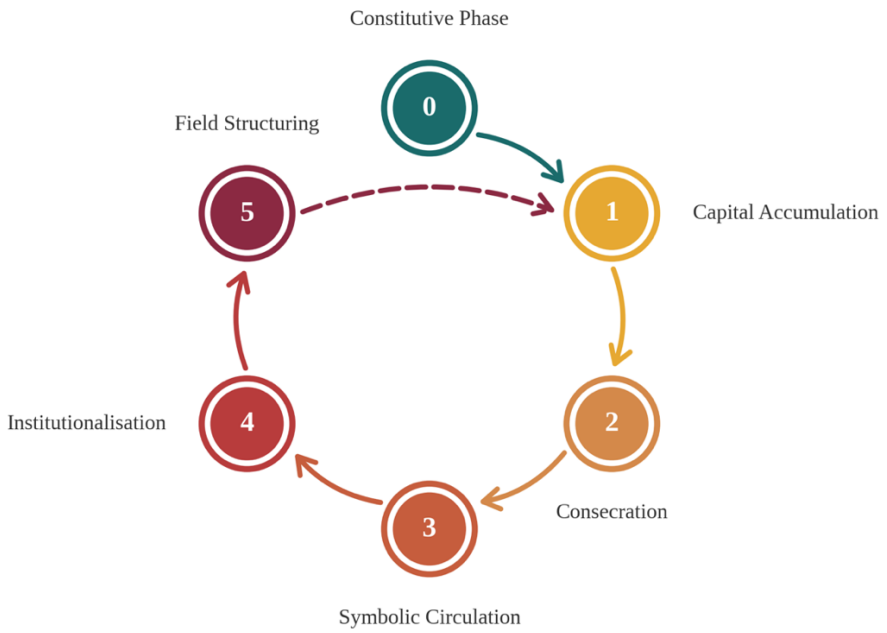
Gatekeeping positions—such as editors, editorial board members, and evaluative authorities—occupy a distinctive role within this structure. Their influence derives less from personal prestige alone than from their location within institutions endowed with accumulated symbolic capital (Bourdieu, 1990, 1991a). Through routine classificatory decisions—defining acceptable topics, methods, and standards—they participate in stabilising the evaluative categories through which recognition is allocated.

4.9 The Symbolic Capital Institutionalisation Model

SCIM unifies the concepts developed in the preceding sections within a process model that shows how symbolic capital becomes institutionalised and how recognition transforms into durable forms of authority. Institutionalisation is thus understood not as a fixed structural endpoint but as an ongoing process of symbolic accumulation and stabilisation, reproduced through practices of recognition and evaluation.

Figure 1

The Symbolic Capital Institutionalisation Model (SCIM)



Note. The model distinguishes a constitutive phase of field formation from five recursive mechanisms through which symbolic capital is reproduced and institutionalised.

SCIM is grounded in Bourdieu's field theory but draws selectively on Frickel and Gross's theory of scientific/intellectual movements (Frickel & Gross, 2005) to specify the collective mobilisation through which emerging domains secure initial recognition. This combination allows the model to distinguish two analytically distinct phases of field development.

The *Constitutive Phase* captures the period in which heterodox actors, operating under conditions of limited legitimacy, mobilise collectively to establish minimally shared arrangements of recognition. During this phase, authority remains provisional and externally dependent: emerging domains draw on imported symbolic capital, strategic alliances, and temporary evaluative arrangements rather than on fully autonomous mechanisms of consecration. As these arrangements stabilise, field dynamics shift. Recognition can increasingly be generated within

the emerging domain itself, as acts of consecration become self-referential and begin to reproduce authority internally. This marks a transition from emergence, where legitimacy is contested and partially borrowed, to reproduction, where authority is produced endogenously and sedimented institutionally. Transitions between these regimes are typically uneven and contested, with emergent domains often combining partial internal consecration with continued reliance on adjacent fields.

4.9.1 The Constitutive Phase

Intellectual novelty is rarely sufficient for field formation. This point is central to Bourdieu's sociology of science and corroborated by Bourdieu-informed studies of disciplinary emergence (Bourdieu, 2004; Gingras, 1991). New fields arise when actors positioned at the margins of established disciplines mobilise collectively to challenge prevailing classificatory schemes, articulate alternative research programmes, and secure recognition for problems and methods not fully accommodated by existing fields.

Heterodox mobilisation characterises this early stage, involving the collective contestation of dominant definitions. Because established journals, evaluative criteria, and reputational circuits are not yet fully available, early proponents must often rely on resources accumulated elsewhere. Symbolic authority is often imported from adjacent disciplines, from highly visible individuals, or from external audiences such as policy actors or funding bodies. Recognition remains fragile and contingent, with legitimacy negotiated across multiple evaluative arenas rather than secured internally. From the perspective of scientific/intellectual movements, this phase is best understood as a coordinated process of collective positioning rather than a purely cognitive rupture (Frickel & Gross, 2005). The constitutive phase concludes when such arrangements become sufficiently stabilised that recognition can be generated primarily within the emerging domain itself. This transition is typically gradual rather than abrupt, as emergent fields often combine provisional internal recognition with continued reliance on adjacent domains.

4.9.2 The Five Loops

In line with Figure 1, the Symbolic Capital Institutionalisation Model (SCIM) distinguishes a constitutive phase (Loop 0) from five recursive mechanisms—capital accumulation, consecration, symbolic circulation, institutionalisation, and

field structuring—through which symbolic capital is reproduced and stabilised once a field reaches a threshold of institutional coherence. These mechanisms operate simultaneously rather than sequentially: the output of each loop becomes an input for the others, forming a self-reinforcing structure (see Figure 1). Each loop is elaborated in the subsections that follow. While typical iterations reinforce existing hierarchies, the system also accommodates change. Heterodox actors may gain access to consecrating positions, and external disruptions can alter prevailing capital conversion rates. The pace of change, moreover, varies across levels: individual visibility can shift rapidly, whereas institutional classifications exhibit considerable inertia—a temporal asymmetry that helps account for the coexistence of stability and transformation within the same field.

Loop 1: Capital Accumulation

Capital accumulation refers to the uneven build-up of symbolic capital within the field. Actors enter with unequal volumes and compositions of economic, cultural, and social capital, which position them differentially with respect to opportunities for recognition. Economic resources enable sustained research activity; cultural capital facilitates conformity with dominant methodological and stylistic standards; and social capital provides access to prestigious collaborators and venues. Recognition therefore accumulates differentially: actors already endowed with advantageous positions are more likely to secure further recognition, while others face structural barriers regardless of the substantive merits of their work.

Loop 2: Consecration

Consecration is the mechanism through which symbolic capital is formally allocated within the field. It operates through institutionally authorised gatekeeping practices—peer review, editorial selection, invitations, prizes, and appointments—that mark certain contributions as legitimate and valuable. These acts derive their efficacy from the symbolic capital already held by the agents and institutions performing them. Consecration is therefore inherently recursive: only those already recognised can effectively confer recognition, a dynamic that contributes to the durability of hierarchical field structures.

Loop 3: Symbolic Circulation

Once recognition is conferred, symbolic capital circulates as recognised authority. It attaches to names, affiliations, journals, and research trajectories, travelling through citation practices, collaboration networks, reputational spillovers, and institutional mobility. This circulation depends on misrecognition: prestige appears

as deserved merit rather than as the outcome of accumulated structural advantages. Through symbolic circulation, authority extends beyond the original act of consecration, shaping aspirations, strategies, and perceptions of legitimacy across the field.

Loop 4: Institutionalisation

Institutionalisation refers to the stabilisation of symbolic capital in durable organisational forms. Through repeated acts of consecration and circulation, recognition becomes embedded in institutions such as journals, editorial boards, evaluation platforms, professional associations, and departmental hierarchies. Objectification is the dominant mechanism within this loop: symbolic capital is stored in institutional infrastructures that outlast individual careers and make accumulated prestige available for future appropriation. Institutionalisation standardises evaluative criteria, concentrates opportunities where prestige already resides, and generates path dependencies that constrain subsequent field development.

Loop 5: Field Structuring

Field structuring designates the feedback effect through which institutionalised symbolic capital reshapes the overall structure of the field. Prestigious institutions, venues, and positions define the classificatory schemes that organise future recognition, delimiting what counts as a legitimate contribution, appropriate methodology, and significant finding. Field structuring thus closes the recursive cycle: the conditions under which future accumulation, consecration, and circulation occur are themselves products of prior institutionalisation.

4.10 Multi-Level Structure of Field Formation

The SCIM operates across multiple analytical levels—macro-level structures, meso-level institutions, and micro-level practices—each with distinct temporalities. These dimensions are analytically distinct but empirically inseparable: field reproduction and transformation emerge from recursive feedback across all three levels. Nelhans's (2022) analysis of performance-based evaluation systems illustrates a comparable dynamic: macro-level funding models shape meso-level institutional strategies and micro-level scholarly practices, which in turn reinforce and recalibrate the evaluative regime itself.

The macro level captures the overall structure of positions shaped by how capital is distributed across a field. This includes zones of dominance and marginality, poles of autonomy and heteronomy, and boundaries with adjacent fields. Such structures become visible through aggregate patterns: citation-based networks that can be used to approximate "invisible colleges" (Crane, 1972; Zuccala, 2006), institutional hierarchies that channel resources, and geographical distributions that reflect centre–periphery relations (Kwiek, 2021). As these structures reflect the accumulation and objectification of symbolic capital over extended periods, they often change slowly, providing a relatively stable backdrop against which struggles over recognition unfold.

The meso level mediates between structural configurations and individual practices. Here, institutional arrangements—journals, editorial boards, professional associations, evaluation committees, and ranking agencies—process and distribute recognition. Meso-level mechanisms possess relative autonomy, operating according to internal logics irreducible to either macro-level capital distributions or micro-level intentions. Institutional change at this level typically unfolds over medium-term temporalities, allowing adjustment without constant instability.

At the micro level, attention turns to the practical dispositions, or habitus, through which actors navigate field structures (Bourdieu, 1977; Bourdieu, 1990). Habitus provides a "feel for the game"—an embodied sense of what is possible, legitimate, or strategically advisable—while illusio sustains investment in the field's stakes. Doxa, hysteresis, and symbolic power (Section 4.5) operate most directly at this level, shaping how actors perceive opportunities, internalise constraints, and adjust strategies. Micro-level dynamics unfold rapidly through repeated decisions about journal submissions, citation choices, and theoretical and methodological positioning.

These levels are linked through recursive feedback rather than hierarchical causation. Macro structures condition meso-level gatekeeping; meso-level decisions shape micro-level strategies; aggregated micro practices, in turn, reproduce or gradually reshape macro structures. The operation of journal prestige—an empirical focus of this thesis—illustrates this dynamic clearly: editorial decisions reshape hierarchies, submission patterns reinforce or challenge them, and the cycle repeats.

Temporal differentiation further structures these dynamics. Short-term temporalities govern immediate cycles of production and recognition, such as publication decisions, grant evaluations, and citation uptake. Medium-term temporalities op-

erate at the level of institutions, shaping the rise and decline of research programmes, shifts in editorial policies, and changing funding priorities over years or decades. Long-term temporalities structure the field more deeply, persisting across generations through durable classificatory schemes, institutional hierarchies, evaluative regimes, and habitus formed through academic socialisation and objectified in organisations. The interaction of these asynchronous dynamics generates both stability and transformation, allowing fields to change while remaining structurally recognisable over time.

Objectified symbolic capital introduces pronounced path dependency into this multi-level system. Accumulated advantages sediment into institutions, making early configurations especially influential for subsequent development. Founding journals, initial evaluation criteria, and early distributions of recognition constrain future possibilities without fully determining them. External shocks—technological change, policy interventions, funding reconfigurations—or internal contradictions can nevertheless disrupt established trajectories, particularly when heterodox actors gain access to consecrating positions.

SCIM distinguishes between a constitutive phase of pre-institutional mobilisation and a subsequent regime of institutional reproduction governed by five recursive mechanisms. Together, these explain how recognition becomes self-referential, as consecrated agents and institutions come to define the criteria through which authority is allocated. In the articles comprising this thesis, these processes are examined through complementary traces of field formation—publication and citation patterns, journal positioning, editorial discourse, and editorial board structures. Because SCIM's mechanisms are specified as field-generic processes rather than case-specific outcomes, the model's broader applicability is considered in the concluding chapter.

5. Methodology

In this thesis, I adopt a reflexive, relational, and multimethod approach to examine the formation of sustainability science as an academic field, grounded in Bourdieu's relational sociology (Bourdieu, 1991b). Scientific production is conceptualised not as an autonomous process of truth discovery but as a historically and socially embedded struggle over multiple forms of capital and their conversion into symbolic capital. I treat journal publications, editorial boards, and bibliometric data and indicators as traces of ongoing contests over legitimacy, recognition, and authority—empirical materials produced through field struggles and classificatory practices rather than transparent measures of scholarly achievement.

Epistemologically, I adopt a methodological constructivist stance while remaining agnostic about strong ontological claims. Bourdieu's concepts of field, capital, and symbolic power are used here as analytical tools for interpreting social practices rather than as descriptions of mind-independent structures. Field theory provides a relational framework for understanding academic practices as structured struggles over recognition and authority. Concepts such as capital accumulation and field structuration are therefore treated as interpretive categories, not as fixed entities existing independently of the practices through which they are produced and sustained. This epistemological orientation underpins the Symbolic Capital Institutionalisation Model (SCIM) developed in Chapter 4, where institutionalisation is conceptualised as an ongoing process of symbolic accumulation and stabilisation, rather than a settled structural endpoint.

The multimethod design of the thesis is grounded in these epistemological commitments. Following Bourdieu's argument that methods must be determined by the nature of the scientific object rather than by disciplinary convention (Bourdieu et al., 1991), I combine statistical techniques (Articles II and IV) with qualitative content analysis of bibliometrics scholarship (Article I) and journal editorials (Article III). Bibliometric and network-analytic methods map the distribution of recognition and the structure of hierarchies, while interpretive analysis reveals the discursive processes through which legitimacy is claimed and contested. This dialectical engagement between objectifying and interpretive approaches advocated by Bourdieu et al. (1991) is supported by recent work in quantitative science studies (Leydesdorff et al., 2020; Milojević, 2025).

5.1 An Integrated Research Design

The methodological framework integrates bibliometric analysis, implemented through social network analysis and geometric data analysis (SNA and GDA), and qualitative content analysis (QCA). These methods are complementary, each addressing distinct dimensions of field formation.

These three methodological families build on foundational bibliometric techniques that structure the empirical analyses. In Article II, the Journal Citation Indicator (JCI) is used as a proxy measure for symbolic capital to operationalise journal selection and hierarchisation. Descriptive bibliometric analyses of publication volumes, citation distributions, and keyword frequencies provide the baseline data from which relational and geometric analyses depart (Articles I and II). In Article IV, compositional analysis of editorial boards—examining the gender, geographical, and institutional distribution of board members—complements the network-analytic approach by mapping dimensions of inequality not captured by relational metrics alone. Co-authorship and keyword co-occurrence network visualisations generated in VOSviewer further support the mapping of intellectual and collaborative structures in Articles I and II (van Eck & Waltman, 2022). These techniques are not ancillary but constitutive: they produce the structured data on which SNA, GDA, and QCA operate.

SNA is applied across three relational domains. Co-authorship networks are used to reveal collaborative structures; co-citation networks trace thematic and intellectual alignments (Article II); and editorial networks uncover latent structures of institutional power and symbolic capital (Article IV) (Baccini & Barabesi, 2009, 2011; Baccini et al., 2020). The analysis employs centrality measures, specifically eigenvector centrality, as well as community detection techniques to map clusters and hierarchies within the field (Traag et al., 2019). These measures operationalise relational advantage as access to recognition and gatekeeping authority, conditioned by field position.

GDA enables the multidimensional mapping of sustainability science's intellectual and social organisation (Article II) (Le Roux & Rouanet, 2004). Multiple Correspondence Analysis (MCA) identifies underlying oppositions and symbolic distances between conceptual groupings based on their categorical associations (Le Roux & Rouanet, 2010). In Article II, MCA is used to implement co-word analysis—operationalised as keyword co-occurrence—to identify and position thematic clusters within a relational field. Complementing this, Principal Component Analysis (PCA) positions journals according to their volume and type of capital (Le Roux et al., 2019). Within this framework, Robust PCA is specifically

utilised to handle skewed bibliometric distributions and mitigate the influence of extreme outliers (Candès et al., 2011). Subsetting the Article II dataset into three historical periods enables diachronic comparison of shifts in symbolic positions and field structures over time (Lebaron, 2018).

QCA is used to investigate the reception of Bourdieu's work within bibliometrics (Article I) and the discursive constitution of sustainability science through editorial texts (Article III). Editorials are treated as "symbolic goods" through which agents assert authority and delineate field boundaries (Bourdieu, 1985). Methodologically, QCA combines the systematic orientation of classical content analysis with discourse-analytic sensitivity. Its abductive logic enables a flexible engagement with texts, bringing theoretically informed categories—such as symbolic capital, field autonomy, and heterodoxy—into dialogue with inductively emergent themes (Krippendorff, 2019).

5.2 Units of Analysis and Data Construction

The research treats journals as primary units of analysis—a choice driven by field-theoretical expectations rather than methodological convenience. From a field-theoretical perspective, journals function as institutional sites where symbolic capital becomes objectified through editorial governance, citation accumulation, and evaluative authority.

Focusing on journals entails a potential risk of methodological circularity: treating journals as units of analysis might appear to predetermine their centrality within the field. However, the analysis employs multiple methods—bibliometric mapping, network analysis, and qualitative content analysis—that could have revealed journals as peripheral rather than central to processes of field institutionalisation. Concretely, this would have been indicated by dispersed citation structures with no stable journal core, weakly centralised editorial-board networks lacking gatekeeping hubs, or editorials that rarely articulate field boundaries or legitimacy claims. The convergence of findings across these methods—demonstrating journal centrality in citation structures, editorial networks, and discursive framings—therefore supports, rather than presupposes, their institutional significance. Journals emerge as concentrated sites of symbolic power—a pattern established through multimethod investigation rather than assumed by the research design.

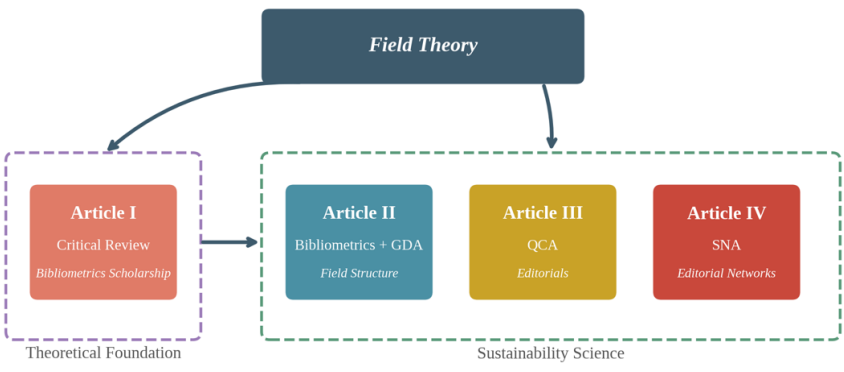
Throughout the project, data preparation—such as author disambiguation, affiliation standardisation, and periodisation—is treated as constitutive analytical work

rather than neutral technical preprocessing. Following Bourdieu, classificatory practices are understood as instruments of symbolic power (Bourdieu, 2018). Decisions concerning how historical periods are segmented, which journals are included, and how institutional affiliations are normalised directly shape the relational structures that emerge from the analysis. These choices are documented explicitly in Articles I–IV, in line with the reflexive commitment that underpins this research.

5.3 Operationalisation Across Articles and Integration into the Symbolic Capital Institutionalisation Model (SCIM)

The model serves as the integrative framework for the thesis as a whole, rather than featuring explicitly within each article. Figure 2 provides an overview of how the four articles relate to one another within this framework, distinguishing theoretical foundations from empirical analyses and highlighting the integrative role of field theory across the thesis.

Figure 2
Overview of the Thesis Structure: Field Theory as the Overarching Framework and the Articles' Empirical Focus and Methods



Each article translates field-theoretical constructs—such as symbolic capital, consecration, legitimacy, recognition, and hierarchy—into analytical categories appropriate to its specific data sources. Article I examined the reception of

Bourdieu's work within bibliometrics scholarship, tracing how field-theoretical concepts have been taken up and operationalised in this research tradition. In Article II, symbolic capital was operationalised through the JCI, publication and citation volumes, and keyword co-occurrence. Robust PCA positioned journals within a geometric space of symbolic differentiation, MCA mapped thematic structures across three historical periods, and co-citation and co-authorship networks traced intellectual and collaborative alignments within the field. Article III extended the analysis to the discursive domain by examining how editorials in core sustainability science journals articulated field boundaries and advanced normative claims. Through qualitative content analysis, constructs such as recognition and symbolic struggle were identified in the ways editorial discourse framed epistemic priorities and institutional legitimacy. Article IV shifted attention to the governance structures of scholarly communication, analysing the composition and network structure of editorial boards. Here, symbolic capital was operationalised through variables such as institutional affiliation, geographical diversity, and patterns of interlocking editorships, interpreted as mechanisms of gatekeeping and institutional reproduction.

These article-specific operationalisations provided the empirical basis for cross-article synthesis. While each article generated findings tied to its particular unit of analysis, the overarching research aim required synthesis across these empirical domains. SCIM was developed inductively in the summary essay to support this synthesis, rather than being advanced as an explicit model within each article. In this integrative effort, analytical categories developed in Articles II–IV are brought into relation through SCIM's core dimensions. Accumulation is reflected in citation-based indicators as well as in the discursive attribution of authority in editorials. Conversion processes are examined in terms of how discursive legitimacy is articulated in editorial texts (Article III) and how such claims relate to more durable positions of authority within editorial governance structures (Article IV). Institutionalisation becomes visible in the stabilisation of symbolic hierarchies, particularly through editorial governance and the stratification of journal prestige. Using SCIM as a synthesis framework supports a multi-scalar analysis linking micro-level practices—such as citation behaviour and editorial discourse—to macro-level patterns of recognition, hierarchy, and symbolic consolidation.

However, the application of SCIM highlights certain limitations. Some constructs, particularly recognition and legitimacy, displayed considerable contextual variability across data sources. Their meanings and operational expressions were

contingent on site-specific dynamics—discursive in editorials, quantitative in citation data, and institutional in governance structures. While this variability does not undermine SCIM's analytical coherence, it points to the need for further refinement when applying the model to other fields or empirical settings.

5.4 Methodological Contributions

The thesis reconceptualises empirical materials—often treated as peripheral or neutral—as central to field formation. In Article II, author keywords are reinterpreted as symbolic positioning devices, and keyword co-occurrence networks are analysed as historically contingent structures through which epistemic alignments and disciplinary boundaries are asserted. Similarly, Article III reframes editorials as central sites of symbolic struggle rather than mere commentary. Interpretive analysis shows how editorials articulate the field's collective self-understanding and project normative visions of sustainability science. A theory-informed coding framework maps editorial discourse onto field-theoretical constructs such as legitimacy, struggle, and consecration through abductive categorisation and iterative refinement—yielding a coding approach adaptable for analysing editorial discourse in other fields.

The thesis further operationalises field-theoretical constructs—specifically symbolic capital—through computational strategies. Article IV establishes a typology of journal governance by combining median eigenvector centrality (MEV) with the Gini coefficient. In this framework, MEV captures relational prestige derived from connections to other prestigious positions, while the Gini coefficient assesses the internal concentration of editorial authority. These metrics collectively constitute a relational framework for analysing how symbolic capital is institutionalised within editorial boards, distinguishing four configurations of governance: dispersed core, concentrated core, dispersed periphery, and concentrated periphery. The accompanying R toolkit, hosted on GitHub, provides a reproducible workflow—comprising modular code and synthetic data—to support replication and adaptation in other scholarly domains (Schirone, 2025).

Methodological contributions also centre on making temporal and relational dynamics analytically tractable. Article II applies Robust PCA to map the structural positions of journals within a geometric space of symbolic differentiation, addressing the highly skewed citation distributions characteristic of bibliometric data. MCA of author-assigned keywords, subsetted into three historical periods,

traces shifting thematic alignments over time. Article IV complements this temporal analysis by mapping interlocking editorships as networks of editorial authority.

5.5 Methodological Limitations

While methodological limitations are addressed in each individual article, several overarching considerations apply at the level of the project as a whole.

First, reliance on Web of Science in Article II introduces structural biases associated with the coverage of this database (Mongeon & Paul-Hus, 2016). It primarily indexes journals published in English, potentially underrepresenting epistemic contributions from the Global South and non-Anglophone contexts. Despite efforts to improve data quality through systematic curation—including document-type filtering, metadata cleaning and standardisation, and keyword harmonisation through exclusion and synonym lists—these structural limitations cannot be fully resolved within the scope of Article II.

Second, the proprietary and closed nature of the bibliometric databases used in Articles I and II affects reproducibility and transparency. While these platforms provide structured metadata and citation linkages useful for large-scale relational analysis, reliance on commercial infrastructures limits independent verification and restricts data access (Leonelli, 2023). To partially mitigate these limitations, Article IV makes analytical scripts and workflows openly available, enhancing transparency and reproducibility with respect to data processing and network construction (Schirone, 2025).

Third, the operationalisation of core concepts such as field and capital through bibliometric and network-based proxies involves inherent simplifications. Although such abstractions enable systematic mapping of symbolic structures, they risk reducing historically embedded social practices to formal regularities. This tension is partially addressed through interpretive contextualisation and cross-method comparison, though the risk of reducing relational processes to formal indicators cannot be entirely eliminated.

Fourth, the periodisation of field development into three discrete phases functions as an analytical device but may flatten the complexity of intellectual evolution. Field trajectories are often recursive, overlapping, and contested. While the segmentation adopted here is grounded in editorial discourse and dataset structure, it cannot fully capture the non-linear temporality of field dynamics. The thesis itself

reflects this contingency: Articles II and III employ different periodisation schemes, each calibrated to the temporal logic of its empirical material, demonstrating that phase boundaries are analytically constructed rather than naturally given.

Fifth, the interpretive framework developed in Article III—including the theory-informed coding scheme and the abductive categorisation of editorial discourse—was constructed from a purposive sample of 76 editorials drawn from three Anglophone journals. While this design enables sustained longitudinal analysis within a coherent discursive space, it constrains the range of editorial voices, epistemic traditions, and linguistic contexts from which the framework's categories were derived. The transferability of the coding scheme to other editorial corpora—particularly those from non-Anglophone or Global South journals—remains to be empirically tested.

5.6 Ethical Considerations

The thesis examines processes of scientific field formation within scholarly communication, focusing on how authority and recognition are structured at the level of institutions, networks, and discourses rather than individual actors. Nevertheless, because the underlying data involve identifiable scholars and their professional attributes, the project adheres to established principles of research integrity, including the *European code of conduct for research integrity* (All European Academies [ALLEA], 2023) and the guidelines of the Swedish Research Council (Vetenskapsrådet, 2024). As the research relies exclusively on publicly available bibliometric data and published texts, formal ethical review was not required under the relevant institutional guidelines.

Aggregating personal attributes such as editors' gender, institutional affiliations, and geographic location necessitates specific privacy safeguards. Although editors act as professional representatives of their institutions, care was taken to avoid identifying individuals through the aggregation of potentially identifying attributes. Aggregation therefore varies by data type. Gender data are reported only as aggregate percentages (e.g., "22.5% of interlocking editors are women") and are not cross-tabulated against other identifying variables. Geographic data are presented at the country, subregional, and continental levels to preserve interpretability while minimising re-identification risk. Institutional affiliations are analysed in aggregate form (e.g., "five institutions account for 103 of the 2,135 total

editorial positions"), enabling the examination of concentration patterns without constructing individual-level profiles. No cross-tabulations across gender, geography, and institutional affiliation are performed, and small-N categories are reported only at broad geographic levels.

Bibliometric and network-based analyses also carry the risk of stigmatising journals, institutions, or regions when highlighting disparities. To mitigate this risk, observed inequalities are interpreted cautiously as outcomes of structural dynamics—such as cumulative advantage, network effects, historical positioning, and mechanisms of prestige by association (Desposato, 2024). This interpretive approach draws on Bourdieusian field theory to contextualise observed inequalities as outcomes of structural dynamics rather than as evaluations of individual performance or institutional quality.

6. Overview of the Included Articles

This thesis comprises four interrelated articles examining the institutionalisation of sustainability science as an academic field. Taking journals as the primary site of analysis, the empirical articles examine the field's symbolic architecture through bibliometric mapping of citation patterns, keyword positioning, and co-authorship networks at country and institutional levels (Article II), qualitative analysis of editorial discourse (Article III), and network analysis of editorial board composition (Article IV). These empirical investigations build on Article I, which examines how Bourdieu's field theory has been operationalised within bibliometric research. In the context of this chapter, the notion of the field's "symbolic architecture" is used as a shorthand for the structured configuration of recognition and authority as it becomes stabilised over time. At the same time, this architecture is understood as continuously produced and negotiated through practices of citation, editorial selection, and scholarly positioning. In this sense, the analysis attends both to the relatively durable organisation of the field and to the ongoing processes through which its symbolic order is constructed.

6.1 Summary of Article I

The first article, *Field, capital, and habitus: The impact of Pierre Bourdieu on bibliometrics*, contributes to addressing **RQ1** by examining how Bourdieu's theoretical framework has been received and adapted in bibliometric research. By mapping the conceptual influence of Bourdieu's work, it establishes an analytical basis for assessing how his relational sociology can be further applied within bibliometrics.

Drawing on a corpus of 182 publications in the bibliometrics literature citing Bourdieu, the study combines structural mapping with content analysis. Co-authorship and co-word network analyses based on author-assigned keywords identify leading contributors and core thematic clusters. These mappings are complemented by a systematic content analysis that identifies the most frequently mobilised Bourdieusian concepts in the corpus, alongside a qualitative interpretation of how those concepts have been translated into bibliometric scholarship.

The analysis reveals that Bourdieu's reception in bibliometrics has been shaped by a small number of scholarly clusters. In the co-authorship network, the US-affiliated Blaise Cronin occupies a pioneering and structurally central position. A

prominent Canadian cluster, anchored by Yves Gingras and Vincent Larivière, is associated with early efforts to introduce Bourdieu's sociology of science into bibliometrics, with Gingras's (1991) study of Canadian physics identified as a pivotal contribution. Conceptually, "field" and "capital" (especially symbolic and social capital) are the most recurrent concepts, while "habitus" appears more sporadically, often in discussions of academic socialisation. The study also shows that while Bourdieu's conceptual vocabulary is widely adopted, his methodological tools—such as GDA—remain underutilised, highlighting a disjunction between theoretical borrowing and methodological implementation.

Beyond mapping influence patterns, the article identifies a selective translation process in which Bourdieu's ideas are integrated into bibliometrics largely through established quantitative proxies: symbolic capital is mapped onto citation structures, while social capital is inferred from co-authorship networks. This conceptual–methodological asymmetry points to gaps that the thesis addresses in subsequent articles.

This article has been published in *Quantitative Science Studies*.

6.2 Summary of Article II

The second article, *The formation of a field: Sustainability science and its leading journals*, contributes to addressing **RQ2** by examining the intellectual and institutional organisation of sustainability science, with journals as the core units of analysis, and field theory as a theoretical lens. Article II thereby reconstructs sustainability science as a structured symbolic space, making visible the distribution of symbolic capital and the hierarchies that underpin its institutional organisation.

The empirical dataset consists of 71,871 documents published between 2001 and 2021 across eighteen purposively selected journals associated with sustainability science. Journal selection was guided by the Journal Citation Indicator (JCI), criteria based on journal scope and Web of Science classification, and the analysis of relevant earlier literature. The study employs co-citation analysis to map intellectual structure, co-authorship analysis to trace collaborative patterns at country and institutional levels, keyword co-occurrence analysis to identify thematic clusters, and GDA (Robust PCA and MCA) to position journals and thematic groupings within a multidimensional symbolic space. The field's development is examined diachronically across three historical phases—2001–2007 (emergence), 2008–2014 (institutional consolidation), and 2015–2021 (thematic diversification)—to trace the shifts in intellectual and institutional alignments.

The analysis reveals a differentiated structure: some journals occupy central positions with high symbolic capital—operationalised through citation and co-citation prominence—while others remain specialised and peripheral. The article also proposes a three-part typology of journals linked to decreasing disciplinary autonomy: a field-building "room of its own" strategy exemplified by *Sustainability Science*; broad sustainability venues such as *Nature Sustainability*, *Journal of Cleaner Production*, and *Sustainable Development*; and specialised discipline-based journals (e.g., *ACS Sustainable Chemistry & Engineering* and *IEEE Transactions on Sustainable Energy*). The co-citation mappings indicate a shift from early dominance of chemistry- and energy-oriented clusters towards a broader configuration in which journals such as *Journal of Cleaner Production* become increasingly prominent, alongside more explicit attention to policy-oriented and transdisciplinary research.

Article II reconstructs sustainability science as a structured symbolic space. The symbolic hierarchies identified here are subsequently examined through their discursive legitimation (Article III) and reproduction through editorial governance (Article IV).

This article has been published in *Scientometrics*.

6.3 Summary of Article III

The third article, *The emergence of sustainability science in the editorials of three scholarly journals*, addresses **RQ3** by analysing editorial discourse as a site where symbolic boundaries are constructed, negotiated, and contested in the institutionalisation of sustainability science.

The empirical material consists of all editorial texts published between 1993 and 2022 in three journals selected for their longevity and continuous availability of editorials across the study period: *Environment, Development and Sustainability*, *Sustainable Development*, and *International Journal of Sustainable Development and World Ecology*. This corpus comprises 76 editorials, enabling comparison across different temporal stages of the field's development.

Editorial discourse functions as a medium for the symbolic construction of sustainability science. Editors use editorial texts to assert the field's autonomy, frame legitimate research agendas, and negotiate tensions between academic excellence and societal relevance. Three historical phases in the field's development are de-

lineated: a “Foundation Phase” (1993–2002) focusing on epistemological positioning; an “Introspection Phase” (2003–2012) characterised by internal critique and consolidation; and a “Diversification Phase” (2013–2022) marked by thematic expansion and an increasingly diverse set of institutional and stakeholder orientations articulated in editorial discourse. To capture shifts in this discourse, the article treats these phases as analytic categories rather than fixed historical breaks.

Sustainability science emerges from the analysis as a heterodox field, marked by a sustained critique of disciplinary orthodoxies and an openness to alternative epistemologies. In its foundational phase, the field foregrounded systems thinking, participatory methodologies, and openness to multiple knowledge systems—including references to Indigenous knowledge. The subsequent introspective period was characterised by a heightened reflexivity, with editorial discourse interrogating the field’s conceptual foundations and methodological commitments—particularly regarding interdisciplinarity and the limitations of ecological modernisation. In the diversification phase, sustainability science expanded its thematic scope to address emergent global crises, including climate change and other global disruptions, while advancing transdisciplinary frameworks that foster collaboration across academic, policy, private-sector, and community actors. Substantively, the editorials portray sustainability science as heterodox, with epistemic pluralism framed as central to its identity.

Article III complements the structural mapping of Article II by reconstructing the discursive processes through which field boundaries and evaluative norms are legitimised.

This article has been published in *Discover Sustainability*.

6.4 Summary of Article IV

The fourth article, *Symbolic capital and inequality in scholarly communication: A bibliometric study of editorial boards*, addresses **RQ4** by examining how symbolic capital accumulates and is distributed within the editorial governance structures of sustainability science. The article conceptualises editorial boards as sites where academic legitimacy is produced and reproduced.

This study analyses 2,135 editorial positions across 30 journals associated with sustainability science. The journal set was constructed by combining 18 leading journals identified in Article II, 3 historically significant titles examined in Article

III, and additional journals from Harley and Clark's (2020) curated list. This purposive selection strategy ensures coverage of the field's intellectual breadth, historical depth, and structural diversity (see Article IV, Section 2.4, for the complete selection rationale and list of journals). The analysis constructs editor–editor and journal–journal networks based on interlocking editorships (editors who hold positions on more than one editorial board). Eigenvector centrality (EVC) is operationalised as a relational measure of symbolic capital, while Gini coefficients quantify inequality in its distribution. This dual approach distinguishes not only which journals occupy structurally central positions, but also whether symbolic capital is concentrated or dispersed within individual editorial boards.

The findings reveal substantial inequality. Only 71 scholars (3.33%) serve on multiple boards, forming an elite group of interlocking editors. Women constitute 22.5% of this group, and the editors with the highest symbolic capital are predominantly located in Western and Northern Europe and Eastern Asia, with Latin America and Africa represented by only two interlocking editors each. The results indicate that the most prestigious editorial network positions are geographically and institutionally concentrated and gender-skewed, which sits in tension with sustainability science's stated commitments to global inclusivity and diverse knowledge systems.

Through the combination of median EVC and the Gini coefficient, the article develops a fourfold typology of editorial governance:

- Dispersed Core: high symbolic capital distributed broadly (e.g., *Journal of Cleaner Production*, *Sustainability Science*).
- Concentrated Core: high symbolic capital concentrated in a few editors (e.g., *Ecological Economics*).
- Dispersed Periphery: low symbolic capital yet relatively egalitarian internal distribution (e.g., *World Development*).
- Concentrated Periphery: low symbolic capital dominated by one or two influential editors (e.g., *Environmental Research Letters*).

This typology demonstrates that journals vary not only in their position within the interlocking network but also in how authority is organised internally.

Article IV shifts the focus from symbolic positioning to institutional power, showing how inequalities identified at the intellectual (Article II) and discursive (Article III) levels are stabilised and reproduced through editorial governance structures.

This article is currently under major revision at *the Journal of the Association for Information Science and Technology (JASIST)*, where revisions are in progress. A preprint is available on SocArXiv.

6.5 Comparative Overview of the Four Articles

Table 1 synthesises the theoretical, methodological, and empirical contributions of the four articles. While each article is designed to address one primary research question, it also contributes evidence relevant to adjacent questions; these connections are indicated in the table and developed fully in Chapter 7, where findings are integrated across studies. Article I establishes the theoretical foundations by examining how Bourdieu's concepts have been applied—and how they can be further mobilised—within bibliometric research. It identifies both existing applications and underexploited methodological tools such as GDA. Article II translates these insights into empirical analysis, mapping the symbolic capital structure of sustainability science as captured through a set of purposively selected journals and tracing thematic evolution across the field. Article III complements this structural mapping with qualitative analysis of editorial discourse, reconstructing how field identity and evaluative norms are symbolically constructed over time. Although Articles II and III adopt different periodisation logics—reflecting the distinct temporal dynamics of bibliometric structures and editorial discourse, respectively—their phases are broadly comparable and collectively trace the field's trajectory from emergence through consolidation to diversification. Article IV extends the analysis to editorial governance, examining how symbolic capital is concentrated through the networks that control knowledge validation and dissemination.

Articles II–IV each document a version of the same structural tension. Article II reveals thematic openness coexisting with structural hierarchy. Article III documents rhetorical commitments to inclusivity alongside boundary-maintenance practices. Article IV exposes governance structures that concentrate authority while articulating commitments to global representation. At each scale—structural, discursive, institutional—the field reproduces hierarchical patterns of recognition even as it advances heterodox claims.

Table 1

Main Contributions of the Articles in the Thesis

Article	Title	RQs	Theoretical	Methodological	Empirical
I	*Field, capital, and habitus*	**RQ1**	Establishes a foundation for applying Bourdieu's relational sociology in bibliometrics; identifies operationalisable concepts and underused methodological tools.	Develops a multimethod protocol for tracing theoretical reception, combining co-authorship/co-word mapping with systematic concept coding.	Maps and critically assesses Bourdieu's reception in bibliometrics.
II	*The formation of a field*	**RQ2, RQ1**	Conceptualises journals as symbolic goods that objectify the field's cultural, social, and symbolic capital; treats author-assigned keywords as proxies for the symbolic capital embedded in publications.	Integrates GDA (Robust PCA; MCA) with co-citation and co-authorship analyses to reconstruct field positions and symbolic distances.	Maps differentiated journal positions associated with symbolic capital, documents shifts in co-citation configurations from early chemistry/energy clusters towards a broader configuration, and proposes a journal typology—illustrated by *Sustainability Science* as a field-building venue—linked to decreasing degrees of autonomy from established disciplines within the journal set.
III	*The emergence of sustainability science*	**RQ3, RQ2**	Theorises editorials as strategic interventions in symbolic struggles over field identity and criteria of legitimacy.	Develops an abductive QCA workflow for longitudinal editorial corpora, combining theory-derived categories with inductively emerging themes.	Identifies three historical phases—Foundation (1993–2002), Introspection (2003–2012), and Diversification (2013–2022)—and documents an inter- and transdisciplinary epistemic self-understanding articulated in editorial discourse.
IV	*Symbolic capital and inequality in scholarly communication*	**RQ4, RQ3**	Conceptualises interlocking editorships as mechanisms of symbolic capital accumulation and institutional reproduction; distinguishes two dimensions of editorial governance: structural centrality within interlocking networks and internal concentration of board-level authority.	Introduces a network-analytical operationalisation of symbolic capital in editorial governance, combining MEV with Gini coefficients to profile boards along both dimensions.	Reveals a concentrated interlocking-editor elite; documents geographic and gender stratification; classifies journals into a fourfold governance typology (Dispersed/Concentrated × Core/Periphery).

Note. EVC = Eigenvector Centrality; GDA = Geometric Data Analysis; MCA = Multiple Correspondence Analysis; PCA = Principal Component Analysis; QCA = Qualitative Content Analysis. RQ1–RQ4 refer to the research questions presented in Chapter 1.

7. Discussion and Integration of the Findings

This chapter synthesises the empirical insights of the four constituent articles to address the thesis's research questions and to clarify what they jointly show about the institutionalisation of sustainability science. The Symbolic Capital Institutionalisation Model (SCIM) informs the cross-article synthesis throughout this chapter, and is applied more directly in Section 7.2 to trace conversion and feedback dynamics.

The articles reveal a persistent tension. Sustainability science articulates normative commitments to interdisciplinarity and transdisciplinarity, inclusivity, and societal engagement, while the empirical material reveals persistent hierarchies of academic authority—in journals, citation structures, and editorial governance. This tension is not reducible to individual inconsistency, but reflects how emerging fields secure legitimacy within established logics of academic evaluation. Sustainability science thus combines a transformative orientation towards complex socio-environmental challenges with reliance on orthodox mechanisms of consecration, including peer-reviewed publication, citation-based evaluation, and institutional prestige. In this chapter, the "transformation paradox" is treated not as a failure of the field's normative commitments but as a structurally generated feature of field development.

This chapter addresses each research question sequentially, integrating findings across the four studies into a coherent account of how recognition is accumulated, converted into authority, and embedded in durable institutional structures.

7.1 Answering the Research Questions

Each research question is addressed through the articles that most directly bear on it, integrating findings across studies to trace how recognition, authority, and legitimacy are produced and stabilised within sustainability science.

Research Question 1. How can Bourdieu's theories on capital and field be applied to the publication, collaboration, and citation patterns of sustainability science?

Research Question 1 is addressed primarily through Articles I and II: Article I establishes how Bourdieusian concepts of field and capital have been operationalised in bibliometrics, while Article II applies this Bourdieusian perspective to publication, collaboration, and citation patterns in sustainability science.

Article I provides the conceptual and methodological point of departure by examining how Bourdieu's relational sociology has been incorporated into bibliometrics. While concepts such as field and symbolic capital are increasingly mobilised, the article also shows that their more demanding relational and reflexive implications are often softened in practice. Article I therefore motivates a field-theoretical reading of bibliometric indicators, treating publication and citation patterns not as neutral measures of quality but as traces of symbolic capital accumulation within a structured space of recognition.

Article II translates this perspective into an empirical reconstruction of sustainability science through co-authorship and citation-based analyses across a purposively constructed set of journals associated with sustainability science, selected using citation-based indicators and scope-based inclusion criteria. The findings indicate a strongly stratified configuration in which a limited number of institutions—predominantly located in China and the Global North—occupy central positions in collaboration and citation networks. These positions are best interpreted as effects of historically accumulated symbolic resources and institutional prestige, rather than as direct reflections of intrinsic scholarly quality (Bourdieu, 1988, 1991b). In this sense, scientific capital appears as a relational asset: standing derives from location within networks of recognition and consecration, and these positions tend to attract further visibility over time.

Read together, Articles I and II demonstrate how Bourdieu's concepts can be applied to make the social architecture of sustainability science visible through bibliometric traces. Publication venues, collaboration patterns, and citation relations jointly constitute a hierarchy of legitimacy in which early advantages in visibility and institutional standing can be reinforced through cumulative recognition. The dynamics of conversion and recursive feedback are taken up more explicitly in Section 7.2.

Research Question 2. How can bibliometric methods, informed by a Bourdieusian perspective, be developed to describe the social and intellectual organisation of sustainability science? How might qualitative insights complement these analyses to capture field formation?

Research Question 2 is addressed primarily through Articles II and III, with Article I providing the conceptual foundation. Article II develops a Bourdieusian bibliometric framework that integrates bibliometric mapping with GDA to position journals, topics, and keywords within a relational field space. Journals are treated as positions defined by relative symbolic capital, operationalised through publication volume, citation patterns, and thematic orientation. The analysis identifies a differentiated hierarchy of journal positions in which a limited subset of venues commands disproportionate recognition and visibility. Article II also proposes a typology of three journal types linked to decreasing levels of disciplinary autonomy. Within this typology, *Sustainability Science* serves as the illustrative field-building case—an attempt to create a "room of its own" for sustainability science—alongside broad sustainability outlets and discipline-anchored specialised venues (Clark, 2007). The GDA and network-analytic maps reveal symbolic distances and oppositions.

Article III complements this quantitative mapping by analysing editorials as institutionally authorised sites of discursive boundary-setting and legitimation. Editorials, written by consecrated editors, speak with delegated authority and articulate field boundaries, epistemic priorities, and shared evaluative commitments. Through an abductive qualitative content analysis of 76 editorials, the article identifies three overlapping phases—Foundation (1993–2002), Introspection (2003–2012), and Diversification (2013–2022)—that capture shifts in how sustainability science narrates its epistemic identity, justifies its ambitions, and negotiates tensions between academic excellence and societal relevance.

Articles II and III thus illuminate different dimensions of field formation: hierarchies of visibility are traced in publication and citation structures, while boundary-setting and legitimation are articulated in editorial texts.

Research Question 3. How can the process of institutionalisation in sustainability science be described through patterns revealed by quantitative and qualitative analyses of its publication output?

Research Question 3 is addressed through Articles III and IV, building on the structural mapping developed in Article II. Articles III and IV examine how comparable hierarchising dynamics are stabilised through discursive and organisational infrastructures, using different empirical materials suited to each domain.

Article III analyses editorial discourse as a site of legitimation and boundary-setting through which field identity, evaluative norms, and lines of inclusion are articulated and stabilised over time. Across the three identified phases, editorials repeatedly frame sustainability science as a distinctive, problem-oriented domain, thereby stabilising shared categories of relevance and rigour even as internal tensions remain visible.

Article IV extends this account by examining editorial governance as an institutional infrastructure through which symbolic authority is allocated and reproduced. Network analysis of editorial boards across 30 journals reveals that gatekeeping authority is concentrated within a small, interconnected subset of the editorial community, predominantly affiliated with a limited set of institutions in the Global North. Editorial roles are both outcomes of accumulated recognition and positions from which future legitimacy can be conferred. They embed symbolic capital in durable organisational forms, shaping the field's criteria of inclusion.

Articles II–IV collectively demonstrate that institutionalisation in sustainability science involves the alignment of publication hierarchies with discursive legitimation and governance arrangements that stabilise symbolic hierarchies over time. Editorials provide a language of justification and boundary-setting, while editorial boards operate as sites of consecration and gatekeeping; their co-evolution helps explain why a field founded on heterodox ambitions can nonetheless reproduce orthodox hierarchies as it seeks legitimacy within established academic evaluation regimes.

Research Question 4. How do editorial board structures in sustainability science journals reflect broader power relations in the social and intellectual organisation of the field?

Research Question 4 is addressed directly by Article IV, which examines editorial governance as a site where gatekeeping authority is allocated and reproduced. Rather than treating editorial boards as neutral administrative arrangements, Article IV conceptualises them as institutional infrastructures through which symbolic power operates in scholarly communication: editorial positions confer the capacity to shape what counts as publishable, visible, and credible within the field.

Empirically, the analysis shows a concentration of editorial influence. A small subset of scholars holds multiple board appointments (an interlocking-editor core), linking influential venues and concentrating consecrating capacity in a limited set of actors. Editorial appointments can therefore be read as a conversion

point: accumulated scholarly recognition—built through publications, citations, and institutional standing—becomes translated into durable gatekeeping authority. Once established, this authority is self-reinforcing: interlocking editorial positions coordinate evaluative influence across venues, shaping the pathways through which reputational credit circulates. Moreover, the typology developed in Article IV reveals that journals with comparable levels of network prominence can nevertheless differ markedly in how authority is distributed internally, suggesting that editorial governance varies along two partially independent dimensions: a journal's position within the interlocking network and the internal concentration of influence within its board.

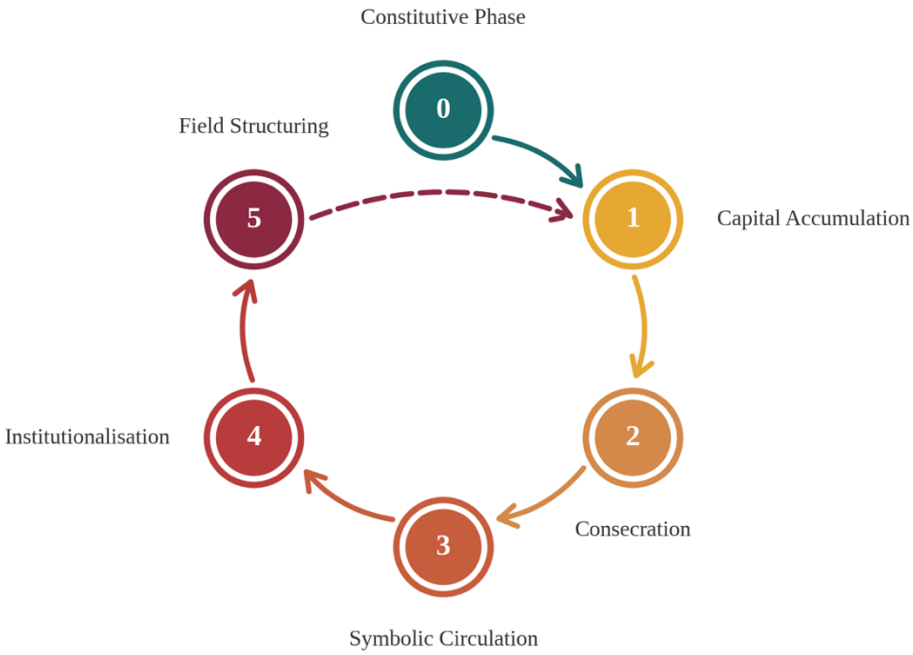
Article IV further indicates that these governance structures are patterned by broader geo-institutional and gendered inequalities. Representation is uneven across regions and institutions, and the distribution of central editorial positions is markedly more concentrated than the distribution of nominal board membership. In field-theoretical terms, this suggests that sustainability science's governance infrastructure does not merely mirror existing hierarchies in academic capital; it also provides a mechanism through which those hierarchies are reproduced within the field's own evaluative institutions.

7.2 Symbolic Capital Conversion and Recursive Dynamics

This section traces the recursive dynamics through which symbolic capital is converted, circulated, and stabilised within sustainability science, using SCIM as an integrative framework. The transformation paradox—introduced in Chapter 1 and traced across the research questions above—emerges from these recursive interactions: the same mechanisms that enable field consolidation also reproduce hierarchical distributions of authority. For ease of reference, Figure 3 reproduces the SCIM figure (Figure 1) introduced in Chapter 4.

Figure 3

The Symbolic Capital Institutionalisation Model (SCIM). Reproduced from Figure 1 (Chapter 4)



Note. The model distinguishes a constitutive phase of field formation from five recursive mechanisms through which symbolic capital is reproduced and institutionalised.

Symbolic capital conversion underpins this dynamic. Recognition accumulated through publication, citation, or institutional affiliation becomes effective authority only once it is ratified through consecrating positions and embedded in durable infrastructures. The analysis of Articles II–IV identifies a recurrent pathway. Publication visibility and journal standing support access to editorial roles—one category of consecrating position. Editorial appointments, in turn, enhance visibility and reputational standing, enabling symbolic capital to circulate across venues through reputational spillovers and interlocks. Over time, these processes transform symbolic capital into objectified authority (embedded in journals, governance structures, and evaluative routines), reshaping what counts as legitimate contribution. In SCIM terms, these dynamics span consecration and circulation,

their institutional embedding, and the resulting effects on field structuring (Loops 2–5, see Figure 3).

These processes are recursive rather than linear. Early advantages in recognition generate further opportunities for consecration, while institutionalised authority feeds back into subsequent patterns of accumulation. As demonstrated in Articles II and IV, prestigious journals and influential editors tend to co-occur within the same networks of recognition and governance, and editorial appointments, in turn, can consolidate journal standing through routine gatekeeping. This helps explain how unequal distributions of visibility and authority can be reproduced through ordinary evaluative practices, while continuing to appear as the outcome of neutral standards of excellence.

These recursive dynamics do not require intentional coordination by individual actors (Bourdieu, 2004). They unfold through the field's internal logic and routine practices—submission strategies, citation conventions, editorial selection, and institutional appointment—sustained by illusio, or shared investment in the field's stakes. Accordingly, even actors committed to epistemic pluralism and transformation may contribute in practice to the reproduction of existing structures.

At the same time, recursion does not imply closure. Because the loops are interdependent, interventions at specific points can alter the conditions under which symbolic capital circulates—for example, by diversifying editorial governance, adjusting evaluative criteria, or expanding the range of legitimate publication venues. However, the empirical patterns documented in the articles suggest that, under prevailing conditions, these dynamics tend to stabilise existing hierarchies more readily than they redistribute authority.

7.3 Mechanisms of Capital Concentration

The concentration of symbolic capital and institutional authority documented in Articles II–IV operates through four interrelated mechanisms: editorial governance concentration, citation stratification, discursive legitimation, and geo-demographic concentration. From the perspective of SCIM, this concentration is not a deviation from the field's normative commitments to inclusivity and epistemic pluralism but an outcome of recursive interactions among consecration, symbolic circulation, institutionalisation, and field structuring.

7.3.1 Editorial Governance Concentration

Editorial governance constitutes a central infrastructure of consecration within sustainability science. As shown in Article IV, editorial board positions are not evenly distributed but concentrated within a relatively small, densely interconnected group of scholars who occupy multiple roles across journals associated with sustainability science.

As discussed in Section 7.2, this concentration reflects recursive dynamics rather than intentional exclusion or coordinated gatekeeping. Scholars who have accrued recognition through publication records, citation visibility, and institutional affiliation are more likely to be appointed to editorial roles. Once appointed, these roles confer the capacity to shape journal scope, review standards, and thematic priorities, thereby augmenting the visibility and authority of those who hold them. Over time, editorial governance becomes a mechanism through which symbolic capital is objectified and stabilised, feeding back into the structuring of the field by shaping what becomes publishable and visible.

Article IV's governance typology further shows that this concentration is not uniform: journals vary independently in their structural centrality within the interlocking network and in the internal distribution of board-level authority. Some journals combine high network prominence with concentrated editorial control, while others with comparable prominence distribute authority more broadly. This variation suggests that editorial governance operates through partially independent dimensions. Interventions targeting one dimension—such as diversifying individual boards—may not address concentration at the network level, where interlocking structures concentrate consecrating capacity across journals.

Editorial concentration can coexist with genuine commitments to epistemic pluralism. From a Bourdieusian perspective, this reflects the relative autonomy of scientific fields. Actors operate under shared evaluative constraints that limit discretionary transformation even in the presence of reflexive awareness (Bourdieu, 2004). Editors may actively seek thematic diversity and methodological openness, yet operate within inherited evaluative frameworks that privilege established trajectories. As a result, governance structures tend to stabilise existing hierarchies even as the field expands substantively. In SCIM terms, editorial governance concentration spans consecration, institutional embedding, and field structuring (Loops 2, 4, and 5).

7.3.2 Citation Stratification

Citation patterns constitute a second mechanism through which symbolic capital is unevenly accumulated and reproduced (Larivière et al., 2013; Merton, 1968). Across sustainability science journals, citation distributions exhibit steep hierarchies consistent with cumulative advantage dynamics: early visibility and prior recognition increase the likelihood of subsequent citation, producing self-reinforcing patterns over time.

Within SCIM, citation stratification reflects the interaction between capital accumulation (Loop 1) and symbolic circulation (Loop 3). Citations record recognition and actively redistribute it, directing attention towards already visible actors, topics, and venues. Articles published in high-status venues benefit from heightened visibility, while highly cited authors gain further access to high-status collaborations and publication opportunities. These dynamics contribute to the stabilisation of field structure (Loop 5) by concentrating attention and authority around a limited set of actors and venues.

Citation hierarchies need not reflect deliberate preference or evaluative bias. They emerge through routine scholarly practices—literature review conventions, reputational heuristics, and disciplinary canons—that collectively reinforce existing distributions of symbolic capital.

7.3.3 Discursive Legitimation

Discursive legitimation operates as a third mechanism through which symbolic capital is stabilised. As demonstrated in Article III, editorials play a distinctive role in articulating shared evaluative commitments, epistemic priorities, and boundaries of legitimate contribution.

Within SCIM, discursive legitimation is closely linked to consecration and symbolic circulation. By framing sustainability science as a distinctive, socially indispensable, and internally aligned field, editorials contribute to the stabilisation of collective expectations regarding what counts as valuable research. This process supports institutionalisation (Loop 4) by anchoring normative claims—about relevance, rigour, and contribution—in established evaluative infrastructures such as journals and peer review, while the field's thematic agenda broadens.

This account of discursive legitimation does not rest on intent or persuasion on the part of individual editors. Instead, it reflects the position of editorials as institutionally authorised texts produced by consecrated actors, whose statements

carry symbolic weight because the editorial voice itself is legitimised through its institutional location, rather than through rhetorical force alone.

7.3.4 Geo-Demographic Concentration

A fourth mechanism concerns the uneven distribution of symbolic capital across geographic and institutional locations. Despite sustainability science's global orientation, editorial authority remains concentrated in a limited number of regions and institutions, predominantly in the Global North (Demeter & Toth, 2020). As shown in Article IV, editorial appointments are disproportionately held by universities and research organisations in North America, Western Europe, and East Asia, with pronounced institutional concentration among a small number of research-intensive universities.

From the perspective of SCIM, these patterns reflect inherited capital distributions that condition access to consecration and circulation. Geographic location, institutional resources, and linguistic positioning shape the initial conditions under which recognition can be accumulated (Loop 1). These advantages are subsequently reinforced through consecrating infrastructures—most visibly editorial governance—contributing to durable field structuring (Loop 5). The interlocking-editor subset intensifies this pattern: the editors occupying the most central network positions are disproportionately located in a small number of regions, reinforcing centre–periphery dynamics within the field's governance infrastructure. Symbolic capital circulates more readily within established centres, making redistribution unlikely in the absence of targeted intervention.

These four mechanisms demonstrate how symbolic capital becomes concentrated through ordinary field processes rather than exceptional practices.

7.4 Interdependence

Editorial governance, citation stratification, discursive legitimation, and geo-demographic concentration form an interdependent system, mutually reinforcing one another through SCIM's recursive loops. Consecration shapes which contributions become visible and citable; citation patterns inform assessments of merit that guide editorial recruitment; discursive legitimation translates these hierarchies into shared evaluative language; and geo-demographic privilege conditions

access to each of these processes. These loops establish a self-reinforcing dynamic, where symbolic capital accumulates, circulates, and stabilises through routine field practices.

This interdependence is sustained not only by institutional arrangements but also by actors' internalisation of the field's evaluative logics. Central to this process is illusio: the shared belief that the stakes of sustainability science are meaningful and worth pursuing (Bourdieu, 1990). Researchers invest in the field because they perceive it as uniquely positioned to address pressing socio-environmental challenges, while institutions and funders support sustainability initiatives as markers of relevance and responsibility. This collective investment sustains participation and reinforces the legitimacy of existing evaluative structures, even where their hierarchical effects are recognised.

Hysteresis further contributes to the durability of these patterns (Bourdieu, 1977). Discursive commitments to inclusivity, epistemic pluralism, and global engagement have outpaced the evaluative and organisational structures through which recognition is allocated. While internationalisation intensifies circulation across national contexts, its effects primarily reinforce the geo-demographic asymmetries described in Section 7.3.4. As a result, normative discourse may articulate transformative commitments while the governance arrangements, citation hierarchies, and institutional infrastructures that condition recognition tend to remain largely stable. This temporal mismatch allows the field to accommodate new themes and vocabularies without corresponding redistribution of symbolic capital.

Symbolic power operates through this combination of interdependence and internalisation. Classificatory schemes—such as notions of rigour, impact, and excellence—appear neutral and meritocratic, yet they are anchored in historically accumulated capital and institutionalised authority (Bourdieu, 1991b). Through repeated participation in evaluative routines, these classifications come to be experienced as natural features of academic life. Field participants contribute to the reproduction of hierarchies not through intent or acquiescence, but through practical adaptation to the structured conditions of recognition.

Understanding interdependence clarifies why the transformation paradox persists. The same mechanisms that sustain the field's coherence and legitimacy also constrain redistribution.

7.5 Institutionalisation and Field Structure

The transformation paradox reflects sustainability science's ongoing institutionalisation. Objectification stabilises symbolic capital by embedding it in durable structures, yet this same stabilisation provides an institutional foundation for continued field development.

The articles demonstrate that institutionalisation in sustainability science operates simultaneously across cognitive, normative, organisational, and regulatory dimensions. Article II's reconstruction of the field's journal-based hierarchy makes visible patterns of thematic orientation and boundary formation that distinguish sustainability science from adjacent domains. Article III's editorial analysis shows how evaluative criteria, epistemic priorities, and quality standards have been articulated through editorial discourse, embedding normative expectations about what counts as a legitimate contribution. Article IV demonstrates that the field has developed organisational infrastructures of editorial governance—boards, interlocking appointments, and hierarchies of gatekeeping authority—that allocate recognition and structure access to consecrating positions.

Institutionalisation enables field development in several ways. It provides stable platforms for knowledge production and facilitates resource mobilisation by establishing recognised channels through which funding and institutional support flow (Whitley, 2000). It also creates legitimate space for heterodox approaches, allowing sustainability science's interdisciplinary and problem-oriented commitments to receive academic recognition (Bourdieu, 1996). The existence of dedicated journals, editorial boards, and publication hierarchies—documented across Articles II–IV—signals a degree of autonomy sufficient to sustain a partially field-specific logic of evaluation, even if this autonomy remains uneven and contested.

At the same time, institutionalisation constrains transformation by generating path dependencies that make subsequent change increasingly difficult (Bourdieu, 1977). Conformity to established evaluative criteria tends to subordinate heterodox innovations to orthodox standards of legitimate scholarship (Hicks et al., 2015). Article IV's finding of a concentrated interlocking-editor core illustrates this constraint: these editors, disproportionately affiliated with a limited set of institutions in the Global North, occupy positions that shape publication decisions and, through them, field visibility.

Within institutionalised fields, change typically proceeds through regulated channels that preserve existing distributions of authority (Bourdieu, 1990). Article

III's identification of a Diversification phase (2013–2022) illustrates this pattern: editorials increasingly invoked justice, decolonisation, and Indigenous knowledge, yet these themes were integrated through conventional publication formats and peer review procedures rather than through fundamental restructuring of editorial governance. Thematic innovation expanded the field's scope without necessarily altering its basic organisation. Similarly, reflexive discussion—such as special issues, editorials, and methodological debates—is institutionally accommodated in ways that allow problems to be articulated without altering the underlying governance structures or evaluative criteria (Bourdieu & Wacquant, 1992). Article IV's governance typology reinforces this point: even journals with high network prominence and broad thematic scope can maintain concentrated internal authority, suggesting that discursive openness and structural concentration are not mutually exclusive.

This pattern of regulated change explains how sustainability science can simultaneously transform and reproduce itself. Within a relatively autonomous scientific field, transformation is pursued through field-internal criteria and institutions that also function to stabilise accumulated symbolic capital, making reproduction and change structurally interdependent rather than contradictory (Bourdieu, 2004). Innovation occurs at the level of discourse, topics, and problem framings, while deeper structures of recognition and authority often remain comparatively stable (Bourdieu, 1977). Change thus unfolds within boundaries that preserve fundamental power relations, rendering the transformation paradox a structurally intelligible feature of field institutionalisation.

7.6 Concluding Synthesis

The analysis developed across Chapter 7 specifies the transformation paradox as an empirically grounded outcome of sustainability science's institutionalisation under conditions of relative autonomy (Bourdieu, 1988; Whitley, 2000). One marker of this consolidation is the establishment of dedicated publication spaces—what Clark describes as sustainability science gaining "a room of its own" (Clark, 2007). Such spaces can support field-specific boundary work and evaluation, while still allowing hierarchical distributions of authority to persist. Using SCIM as an integrative reference point, the chapter has shown how symbolic capital is accumulated, converted, and stabilised through recursive interactions among publication practices, editorial governance, discursive legitimation,

and geo-demographic structuring. These processes jointly sustain the field's legitimacy while constraining the redistribution of authority.

The same infrastructures that enable sustainability science to function as a coherent and credible field—journals, editorial boards, evaluation criteria, and institutional affiliations—also serve as sites where symbolic capital is objectified and rendered durable. Discursive shifts, thematic diversification, and expanded problem framings are accommodated more readily than changes to consecrating institutions or criteria of recognition.

This does not imply that redistribution is impossible (Bourdieu, 1986). Rather, the analysis suggests that meaningful transformation is unlikely to emerge from discursive commitment alone. Because symbolic capital circulates through interdependent feedback loops, interventions that target only one dimension are likely to have limited effects—for example, publication diversity without changes in governance, or discursive inclusion without shifts in evaluative criteria. Redistribution would require coordinated changes across multiple sites of the field, including editorial governance, criteria of consecration, and the institutional conditions under which recognition is accumulated.

By treating the transformation paradox as a structural condition rather than a normative shortcoming, this chapter provides a reflexive basis for understanding both the achievements and the limits of sustainability science (Bourdieu & Wacquant, 1992). The field's continued evolution will likely depend less on resolving this paradox than on navigating it within the constraints and possibilities of relative autonomy.

8. Conclusions and Contributions

Drawing on four empirical studies, the thesis shows how sustainability science consolidates as a recognisable field through recursive processes of symbolic capital accumulation that organise recognition, authority, and legitimacy. These processes are theorised through field theory and examined empirically using bibliometric, network-analytic, and qualitative approaches (Bourdieu, 1988). The thesis clarifies how sustainability science develops both as a transformative knowledge project and as a stratified academic domain.

8.1 Theoretical Contributions

The primary theoretical contribution of this thesis is the Symbolic Capital Institutionalisation Model (SCIM). SCIM integrates a field-theoretical conception of bibliometrics with an account of symbolic capital as objectified in scientific journals and their editorial governance structures. Together, these elements provide an analytical framework for examining how evaluative infrastructures and mechanisms of scholarly recognition organise legitimacy, authority, and hierarchy in emerging scientific fields.

Bibliometric indicators—such as impact factors, citation counts, and journal rankings—are treated not as neutral descriptors, but as symbolic mechanisms that help constitute the hierarchies they appear to measure. They participate in the construction of academic value by codifying recognition and directing attention, thereby shaping publication strategies, reputational trajectories, and field boundaries. Indicators can be understood as evaluative devices (Hylmö et al., 2025) and, in related terms, as judgment devices (Hammarfelt & Rushforth, 2017); from a Bourdieusian perspective, such devices intervene in field organisation by shaping what is recognised and rewarded. As Article I demonstrates, this positions bibliometrics as a reflexive mode of field analysis rather than simply a technical instrument for science policy.

A second constitutive element of SCIM is the concept of objectified symbolic capital. This concept specifies how prestige and recognition become embedded in durable infrastructures of scholarly communication—journals, editorial boards, indexing systems, and ranking systems—that persist over time and exert structural influence beyond individual agents. Once institutionalised, symbolic capital

acquires inertia: it shapes research practices, reviewer expectations, and editorial decision-making. In this sense, SCIM develops Bourdieu's account of objectification by clarifying how symbolic capital is stored and reproduced through communicative infrastructures that stabilise hierarchies over time (Bourdieu, 1986).

SCIM also clarifies how interdisciplinary and heteronomous fields consolidate academic legitimacy. Fields grounded in heterodox ideals—such as transformation, inclusion, or transdisciplinarity—often depend on orthodox academic mechanisms to secure recognition. Early proponents may import symbolic capital from adjacent, more established domains, legitimising the emerging field while also transmitting external hierarchies. Over time, citation stratification, editorial concentration, and stabilised evaluative routines generate path dependencies that resist redistribution of symbolic resources.

Although SCIM is derived from the thesis's empirical analyses, it is proposed as a conditionally portable framework for examining symbolic capital accumulation in academic contexts characterised by comparable evaluative infrastructures and recognition mechanisms. Its applicability rests on structural similarity rather than empirical generalisation, and it does not claim explanatory reach beyond cases in which analogous configurations of editorial governance, citation practices, and evaluative routines can be demonstrated empirically.

8.2 Empirical Contributions

The thesis reconstructs sustainability science's symbolic economy, identifying a consistent pattern: despite expansion in publication volume, geography, and thematic diversity, symbolic capital remains concentrated within a limited set of journals, institutions, and actors.

The three empirical articles on sustainability science (Articles II–IV) substantiate this pattern of symbolic capital concentration from complementary angles. Article II reveals differentiated journal positions and stratified patterns of recognition that remain salient as the field expands. Article III analyses editorials as institutionally authorised sites of discursive legitimation and delineates three historical phases—Foundation (1993–2002), Introspection (2003–2012), and Diversification (2013–2022). Across these phases, editorials move from early field-definition and legitimation towards more explicit reflection on interdisciplinarity and evaluation, and later towards transdisciplinarity, equity and social justice, and the SDGs, while consistently returning to tensions between scientific rigour and policy relevance. Article IV shows that editorial governance is networked and unevenly distributed,

with central positions concentrated among a limited set of editors. Together, these findings illuminate the transformation paradox: sustainability science has expanded in scale and scope even as symbolic authority remains concentrated.

8.3 Methodological Contributions

The thesis employs a multimethod design to operationalise key concepts from field theory across three analytical dimensions: relational, positional, and discursive. Network analysis maps the relational distribution of symbolic capital through co-authorship, co-citation, and interlocking editorships. Geometric Data Analysis (GDA) visualises field positions and stratification patterns. Qualitative content analysis traces discursive processes of legitimation and boundary-setting in editorial discourse.

By conceptualising bibliometric data as socially produced traces rather than transparent indicators of quality, the analysis questions taken-for-granted assumptions about visibility, merit, and academic value (Wouters, 2014). The methodological workflow is designed to support transparency and reproducibility, though replication of the bibliometric analyses remains partly contingent on access to Web of Science.

As part of this methodological contribution, the thesis provides an open-access bibliometric toolkit hosted on GitHub (Schirone, 2025). The toolkit operationalises the analytical strategies developed in Article IV—including the combination of median eigenvector centrality with Gini coefficients to profile editorial governance—offering modular code, example data, and a reproducible workflow for investigating editorial networks and symbolic capital dynamics. This supports reuse of the approach in other domains where editorial governance and evaluative infrastructures are analytically relevant.

8.4 Practical Implications

The findings of this thesis have implications for journal editors, editorial boards, research evaluators, and institutions concerned with the organisation of scholarly communication and the promotion of epistemic diversity within sustainability science. More broadly, these findings are relevant for understanding how research evaluation systems operate through scholarly communication structures, shaping which contributions are recognised and legitimised.

Symbolic capital concentration is not simply an aberration that can be corrected through isolated measures, but a structural feature of how academic fields secure legitimacy within existing evaluative regimes. The transformation paradox shows how fields committed to inclusivity and interdisciplinarity may nonetheless reproduce hierarchies through routine practices of citation, editorial selection, and institutional affiliation. Recognising this dynamic is important in practice because it reframes diversity initiatives not as straightforward correctives, but as interventions operating against durable structural tendencies. This perspective may temper expectations of rapid change while focusing attention on where sustained efforts are most likely to have impact.

Within SCIM's recursive architecture, some points of intervention are more tractable than others. Editorial governance is one such point: as a mechanism of consecration, it has downstream effects on symbolic circulation and institutionalisation. The concentration of symbolic capital within interlocking editorial networks, as documented in Article IV, suggests that deliberate diversification of editorial boards—across geography, institutional location, career stage, and epistemic tradition—may contribute to moderating self-reinforcing patterns of recognition. Such efforts would not eliminate symbolic hierarchy, but they could pluralise the sources from which consecration flows, expanding whose contributions are rendered visible and authoritative.

A second set of implications concerns evaluation practices. The thesis shows that bibliometric indicators function not as neutral measures of quality, but as evaluative devices that shape the distribution of recognition. For research evaluators and funding bodies, this supports approaches that complement citation-based metrics with qualitative assessment, recognise diverse publication venues, and resist conflating journal prestige with scholarly merit (Hicks et al., 2015). Such shifts could alter the conversion rates through which different forms of contribution are recognised.

For sustainability science scholars, the thesis underscores a tension between explicit commitments and institutional positioning. Scholars seeking to advance transdisciplinary, solution-oriented, or Global South-centred research may find their work undervalued by evaluative systems calibrated to established academic standards. Institutional support for alternative dissemination venues, multilingual publishing, and non-traditional outputs could partially mitigate these disadvantages, though such efforts require sustained commitment and may carry reputational risks within prevailing reward structures.

8.5 Limitations

Several limitations shape the scope and interpretation of the thesis's findings. The citation and co-authorship data are sourced exclusively from the Web of Science Core Collection, a curated database whose coverage privileges English-language journals and publications from the Global North (Mongeon & Paul-Hus, 2016). This infrastructural selectivity introduces a visibility bias that likely underrepresents scholarship published in regional, non-Anglophone, or alternative venues, as well as forms of knowledge production not indexed within mainstream citation databases. The patterns of symbolic capital concentration identified in this thesis should therefore be interpreted as reflecting the structure of the indexed scholarly record rather than the full global and epistemic diversity of sustainability science. Similarly, the editorial discourse analysis focuses on three Anglophone journals, limiting the extent to which the findings can be generalised to sustainability science's broader research ecosystem, particularly in underrepresented regions and epistemic communities.

In empirical terms, the thesis analyses material covering different temporal segments of sustainability science rather than constructing a single continuous longitudinal dataset. Articles I–III reconstruct long-term dynamics of field formation and discursive change using bibliometric and editorial data spanning multiple decades, while Article IV provides a focused cross-sectional analysis of contemporary editorial governance. This mixed temporal design identifies processes of emergence, consolidation, and stabilisation, though it cannot determine whether observed patterns—such as symbolic concentration or editorial centralisation—will persist unchanged.

The operationalisation of field-theoretical constructs through bibliometric and textual indicators necessarily involves simplification. Eigenvector centrality captures relational positioning within editorial networks but does not exhaust the meaning of symbolic capital, which in Bourdieu's (1986) formulation also encompasses embodied dispositions and tacit forms of recognition not visible in structural data. Similarly, the qualitative content analysis of editorials involves interpretive decisions about how discursive claims map onto theoretical categories such as consecration and legitimation. These translations should be understood as partial operationalisations.

The thesis is theoretically grounded in Bourdieu's field theory, which foregrounds symbolic capital, hierarchy, and strategic competition as structuring forces within scientific fields. While this framework illuminates mechanisms of recognition,

consecration, and authority, it may underemphasise dimensions of scientific practice not readily captured by a field-structural account centred on symbolic capital, including material infrastructures of knowledge production, epistemic labour, and forms of coordination that do not map cleanly onto struggles over recognition (Sismondo, 2011).

8.6 Future Research Directions

The limitations also suggest directions for future research. Alternative perspectives—such as actor-network theory for material infrastructures or institutional theory for organisational routines—could address dimensions of scientific practice that a field-structural account centred on symbolic capital underemphasises (DiMaggio & Powell, 1983; Latour, 1987). Longitudinal research could further assess whether editorial reforms or diversity initiatives yield measurable shifts in symbolic redistribution over time.

Future work is also needed on the digital infrastructures that increasingly mediate scholarly visibility and recognition. Infrastructures become visible primarily when they break down or become contested, yet they continuously structure access, authority, and participation (Star & Bowker, 1999). In academic publishing, platforms such as megajournals, indexing services, and algorithmic recommendation systems embed evaluative functions into opaque and commercially governed architectures. This platformisation, as Ma (2023) argues, restructures scholarly communication by displacing traditional modes of editorial oversight with automated curation and metric-driven visibility. Megajournals were initially framed as egalitarian alternatives to disciplinary gatekeeping (Spezi et al., 2017), yet empirical research shows that they generate new stratifications that reproduce symbolic inequality through alternative mechanisms of visibility and evaluation (Siler et al., 2020). These developments offer a test case for SCIM in environments where recognition is mediated by digital platforms rather than disciplinary authority alone.

Future research could further foreground epistemologies and publishing systems from the Global South. Multilingual approaches, comparative fieldwork, and sustained engagement with regional infrastructures could surface models of scholarly legitimacy currently obscured by dominant indexing regimes. Such work would contest the universalising tendencies of dominant bibliometric methods and expand the theoretical horizon of field theory beyond its Eurocentric intellectual lineage (Bhambra, 2016; Go, 2016).

8.7 Final Reflections

The institutionalisation of sustainability science exemplifies a broader structural condition shaping all heterodox academic fields: recognition must be secured through the very mechanisms that reproduce inequality. SCIM specifies how this transformation paradox operates: expansion in volume and diversity proceeds simultaneously with persistent concentration in symbolic authority.

The thesis traces how recognition is produced, legitimised, and stabilised across relational, positional, and discursive registers, offering a sociological account that denaturalises academic hierarchy. The multimethod approach reveals what single-method studies miss: heterodox fields reshape discourse while reproducing orthodox structures. Interdisciplinarity expands while authority concentrates. Transformative ideals circulate while evaluative mechanisms ossify. Understanding transformation and reproduction as interdependent rather than opposing constitutes the central theoretical contribution.

These dynamics extend beyond sustainability science. Fields pursuing epistemic justice, interdisciplinary collaboration, or institutional transformation confront the same infrastructures through which recognition is distributed and power is organised. Making visible what governs academic legitimation does not resolve the transformation paradox, but it creates conditions for recalibrating how symbolic capital circulates.

Recalibration requires confronting a structural condition: transformative commitments cannot bypass the symbolic reward structures of the field—they must be pursued through them, even as this pursuit reproduces aspects of the hierarchies being challenged. This demands a sociologically informed strategy, not resignation. The transformation paradox is structural, yet structures are neither immutable nor self-executing. They require constant reproduction through practice—editorial decisions, citation choices, evaluative judgements, institutional investments—and it is precisely in these practices that opportunities for recalibration exist. The question becomes not whether to engage existing infrastructures, but how to redirect them towards more equitable and epistemically plural configurations.

Understanding how symbolic capital is accumulated, stabilised, and reproduced—its origins, mechanisms, and durability—provides an analytical basis for scholarly projects that seek not merely to describe academic hierarchies, but to engage them strategically. Such engagement clarifies where and how intervention is possible: within the everyday practices through which recognition is conferred,

authority is exercised, and academic value is made durable. From this perspective, scientometrics and bibliometrics within LIS—read alongside the sociology of science—occupy a critical analytical position: they are reflexive modes of inquiry that make visible the institutional and evaluative structures through which scholarly recognition, authority, and legitimacy are produced and stabilised.

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Sustainability science aims to transform how knowledge is produced and disseminated to address global environmental and social challenges. Yet as it institutionalises, it confronts what this thesis calls the ***transformation paradox:*** how can a field committed to transdisciplinarity and transformation avoid reproducing the hierarchies of academia?

This thesis examines the emergence and development of sustainability science, and the role of its journals, through the lens of Bourdieu's sociology. Drawing on bibliometric mapping, network analysis, and qualitative content analysis of editorials, it traces how authority, recognition, and legitimacy are structured in this research field. The analysis identifies three historical phases—Foundation (1993–2002), Introspection (2003–2012), and Diversification (2013–2022)—each marked by shifts in epistemic orientation and the redistribution of symbolic capital. Editorial discourse functions as a central site of symbolic struggle, where competing visions of sustainability science—and rival claims to definitional authority—are articulated, contested, and selectively legitimated.

Scholarly journals and editorial networks, the study shows, are not neutral infrastructures but key sites where recognition is distributed and knowledge contributions become visible. While sustainability science promotes inclusivity and transformation, its institutionalisation does not escape the influence of established academic structures. By reconceptualising scholarly communication as the reproduction of symbolic capital, the thesis shows why transformation in academia and scholarly publishing may remain constrained, even in fields committed to transdisciplinarity and transformation.

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