Transformative enterprises and sustainable regional development in the timber sector

Inauguraldissertation
der Philosophisch-naturwissenschaftlichen Fakultät
der Universität Bern

vorgelegt von
Miriam Dorothea Hug
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Prof. Dr. Heike Mayer
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Co-Leiterin:
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Eidg. Forschungsanstalt für Wald, Schnee und Landschaft WSL

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License

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Von der Philosophisch-naturwissenschaftlichen Fakultät angenommen.

Bern, 25. Juni 2025

Der Dekan/Die Dekanin
Prof. Dr. Jean-Louis Reymond

Abstract

Planetary boundaries have been exceeded but the prevailing economic structures still depend on continued growth. In this situation, calls for a sustainability transformation understood as systemic ecological, technological, economic, institutional and cultural changes towards modes of living, working and economic activity that do not exceed the ecological basis of the planet, are getting louder. But who could contribute to changing current unsustainable economic structures and what sectors may play a pivotal role in this transformation? This dissertation examines one category of actors who could become important change agents, so-called transformative enterprises, pioneering small and medium-sized enterprises (SMEs) that strive for fundamental changes towards sustainability. Empirically, the focus lies on the timber sector. The latter not only has the potential to replace petroleum-based substances and products but is also an important pillar of local economies – particularly in peripheral and mountain areas – and can thus contribute to sustainable regional development.

This dissertation addresses the lack of research investigating the role of SMEs in sustainability transformations. Also, the timber sector has only received little attention in economic geography research and its role for sustainable regional development remains unexplored. Further, research on drivers and barriers of sustainability transformation is sparse. By drawing on evolutionary approaches to economic geography and post-growth geographies, this thesis contributes to filling these research gaps. It investigates (1) in what ways and to what extent SMEs can shape sustainability transformations, (2) how the timber sector can promote sustainability transformation and sustainable regional development and (3) what the drivers and barriers of sustainability transformation are in the timber sector. The dissertation's findings were gained by synthesizing the results of three research articles, which applied a qualitative research design with a literature review and semi-structured interviews as the main methods of investigation. In two empirical case studies, it examined the timber sector in Switzerland (Canton of Bern) and Austria (province of Vorarlberg). Despite social and cultural commonalities, the timber sector in those two regions differs in terms of structure and performance, which allows insightful comparisons.

The findings demonstrate that SMEs can indeed contribute to sustainability transformations. Different facets of that transformative potential are circumscribed by the definition of transformative enterprises with nine key dimensions and 30 corresponding indicators developed in this thesis. The results also show how the extent to which SMEs have transformative potential varies between five empirical types of potentially transformative SMEs identified in the timber sector. The findings moreover illustrate the transformative potential of the timber sector, i.e. how it can promote sustainability transformation and sustainable regional development beyond technological innovation for the bioeconomy or digitalization of production: the timber sector can contribute to sustainability transformation through regional value creation and by providing local jobs. Besides, the timber sector can be a driver of a lived building culture and transmit the values of craftmanship and ecology. Finally, this thesis shows that resourceful individuals who act as change agents are important enablers of sustainability transformation, especially if they encounter favorable organizational and structural preconditions. At the same time, change agents face important limits of change agency which range from individual limits (e.g. limited financial or time resources) to unfavorable structural preconditions, namely the prevailing neoliberal market system and growth-oriented economy.

Acknowledgements

Even though one can easily feel like a lonely traveler while writing a dissertation, I would never have been able to accomplish this task without the support of many people. I am very grateful and want to say **thanks**…

…to my family for emotional and practical support on this long journey. My parents Christian and Bettina always supported my decision to follow an academic education and my sisters Noëmi and Salome are companions through thick and thin. Juliette freed me from care responsibilities for countless hours. Christoph is a wonderful partner in life and our daughter Zora a wonder of life I will never want to miss again.

…to my supervisors Heike Mayer and Irmi Seidl for their critical questions and helpful comments and for their understanding attitude at all moments. Writing a dissertation while founding a family was only possible because they offered me pleasant working conditions.

…to the economic geography research team at the University of Bern for making the office a pleasant work environment and for intellectual and moral support. Special thanks to Ellena Brander, Micaela Lois, Flavian Pichonnat and Sinje Grenzdörffer who were great advisors, proofreaders and office mates in these last months.

…to Ottavia Cima for taking the time to read, correct and comment on a first version of the manuscript.

…to Julia Affolderbach for taking the task of the external referee.

…to the team of the project *Regionale Wertschöpfung Wald und Holz* which was led by the Wyss Academy for Nature in collaboration with the Canton of Bern and the industry association Lignum Bern and of which this dissertation was part. Special thanks to Roger Schmid for initiating this collaboration and trusting in the project. Thanks also to Thomas Lüthi, Barbara Stöckli and Jolanda Brunner for facilitating access to the field and to Olivier Jacquat for intellectual support.

…to all those people who supported and motivated me all along my academic journey. My previous work with Martin Müller and his research team was a particularly formative experience.

…to all interview participants without whom this dissertation could not have been realized for sharing their time and knowledge.

…to the Wyss Academy for Nature and the Economic Geography Unit of the University of Bern for financial support.

Table of contents

List of tables

List of figures

Abbreviations

EEG	Evolutionary economic geography
CORIS	Challenge-oriented regional innovation system
CSS	Comparative Case Study Approach
MLP	Multi-Level Perspective
NRP	Neue Regionalpolitik (New Regional Policy)
RIS	Regional innovation system
SME	Small- and medium sized enterprise
WCED	World Commission on Environment and Development
Wf4.0	Wirtschaftsförderung 4.0 (Economic Development 4.0)

I. INTRODUCTION

1 Introduction

Transformative enterprises – pioneering small and medium-sized enterprises (SMEs) who strive for fundamental changes towards sustainability (Pfriem *et al.* 2015, Pfriem 2021, Hug *et al.* 2022) – can play a key role in changing current unsustainable economic structures and finding ways towards **sustainable regional development**. This dissertation examines transformative enterprises in the **timber sector** and illuminates the potentials of the timber sector in changing development paths towards more sustainable modes of living and working. Investigating transformative practices of key economic actors like SMEs and the contribution of a natural resource-based sector to sustainable regional development is highly relevant given the excess of planetary boundaries (Richardson *et al.* 2023) and the unsustainability of growth-based economies (Jackson 2017). SMEs and the timber sector have the potential to address Grand Societal Challenges such as climate change and economic distortions (cf. Lund Declaration 2009), which can be seen as symptoms of current unsustainable economic structures.

SMEs are often overlooked as **drivers of transformative change**, even though economic geography acknowledges that they are pivotal for implementing sustainable economic practices, altering development paths and transforming society (Affolderbach & Schulz 2024, p. 323). **Evolutionary economic geography (EEG)** which seeks to explain current structures from history (Baumgartinger-Seiringer *et al.* 2020, p. 2) and **post-growth geographies** which discuss possibilities of economic activity within planetary boundaries (Lange *et al.* 2020), are useful for studying sustainability transformation. In those two research strands, however, few studies address SMEs or investigate enterprise practices and characteristics. EEG discusses firms[1] in a generalizing manner, even though they are said to be crucial for "greening" industries (Trippl *et al.* 2020) and ascribed the *"capability to generate path-breaking innovations"* (Grillitsch 2019, p. 684). EEG speaks of firms under the banner of new firms (startups), incumbent firms (large, influential firms) (e.g., Jolly *et al.* 2020), or innovative entrepreneurs (e.g., Grillitsch 2019). Meanwhile, it is unknown what concrete characteristics and practices can lead to firms influencing regional path development (i.e., the way sectors evolve over time (Hassink *et al.* 2019)) and sustainability transformations. Post-growth geographies also show limited engagement with SMEs. Some contributions address green entrepreneurs or ecopreneurs (e.g. Affolderbach & Krueger 2017, O'Neill & Gibbs 2016), but knowledge on SMEs as actors of transformative change remains sparse (Liesen *et al.* 2013, Posse 2015). Post-growth geographies more often focus on alternative organizations (Affolderbach & Schulz 2024, pp. 231–237) – sometimes labelled 'eco-social enterprises' or 'post-growth organizations' (Schmid 2020, p. 62f.) – than on 'ordinary' economic actors like SMEs. This is an important knowledge gap because SMEs make up more than 99% of all enterprises in many European economies (Muller *et al.* 2021, p. 8) and contribute to 13% of the world's carbon emissions (Hampton *et al.* 2023, p. 1). At the same time, they can promote low-carbon futures (North 2016). Hence, SMEs are substantial for sustainability transformations.

The role of the **timber sector** for sustainable regional development is also little researched in economic geography, even though it is ascribed a key role in sustainability transformations due to CO_2

[1] The EEG literature mostly uses the term 'firm'. In many cases, 'firm' relates to a relatively larger business, while the term 'enterprise' means a smaller one. The difference between the terms is, however, not clear cut. This dissertation uses the terms 'firm', 'enterprise' and 'business' synonymously.

storage in wood and its potential to substitute polluting materials (e.g., European Commission 2018). A few researchers addressed economic challenges of sustainability transformations with studies on industrial restructuring in the timber sector (Edenhoffer & Hayter 2013, Hayter & Edenhoffer 2016) or the influence of global production networks of timber on regional development (Murphy & Schindler 2011). Others examined the timber sector considering environmental protection and climate change (Gibson & Warren 2016, Gibson & Warren 2020). Some economic geographers illuminated aspects of bioeconomy in the timber sector (Hansen & Coenen 2017, Blair *et al.* 2017, Jolly *et al.* 2020, Martin *et al.* 2023) or evaluated bioeconomy strategies from a post-growth perspective (Creutzburg 2022). Finally, Grabher (2018) addressed the role of the timber sector in sustainable regional development by showing how anti-mainstream ideas of 'building artists' flourished in Vorarlberg's timber sector. This limited engagement with the role of the timber sector is regrettable because in human history, forest-based industries have been at center stage in profound socio-ecological transformations (e.g., the clearance of forests for settlements in the Middle Ages, the emergence of regulated forestry in the beginning of the 19th century and the ecological revolution in the 1970s). Today, climate change and the striving for a green economy (exemplified by the European 'Green Deal'[2]) or even more profound socio-economic changes mark the beginning of another transformation. Here again, forest-based industries can be central players (Heinimann & Teischinger 2024, p. V). Drawing on the timber sector for researching sustainability transformations thus promises to be insightful. Moreover, the timber sector can create important job opportunities in the local economy (Gauzin-Müller 2011, p. 207) and should therefore be considered in regional development.

The focus of this dissertation on SMEs on the one hand and the timber sector on the other hand implies that **drivers and barriers of sustainability transformation** can be studied from a firm (or individual) level perspective and form a systemic (or regional level) perspective. Knowledge on drivers and barriers of transformation is still fragmented in EEG and post-growth geographies. As regards **drivers of change**, EEG has explored structural components like industrial structures, organizational support structures, institutional set-ups or natural assets (e.g. Trippl *et al.* 2020, MacKinnon *et al.* 2019b). More recently, researchers have illuminated the role of agency – among them firm-level and system-level agency – in changing development paths (e.g., Grillitsch & Sotarauta 2019, Bækkelund 2021, Grillitsch *et al.* 2021, Jolly *et al.* 2020, Benner 2023, Blažek & Květoň 2022). Individual actor characteristics are moreover mentioned as an important factor influencing the type of agency and direction of change (Grillitsch *et al.* 2024, p. 14). Post-growth geographies have so far mostly examined practices of individuals or firms that can promote transformation, such as social innovations, working time reduction or makerspaces (Lange *et al.* 2020), while a few studies also mention structural aspects such as tax advantages and state subsidies (O'Neill & Gibbs 2016). In terms of **barriers to transformation**, EEG has vastly studied structural barriers (Grillitsch 2019) like lock-ins (e.g., Hassink 2010) or system failures (Tödtling & Trippl 2005) but neglected accounts of the limits of change agency individuals or firms may encounter (Eder & Döringer 2022). In post-growth geographies, perspectives on barriers transformation are less prominent. Instead, research mostly focuses on bottom-up activity and post-growth pioneers (Lange *et al.* 2024, p. 335). The broader post-growth debate too knows very few studies, which explicitly identify transformation barriers (Strunz & Schindler 2018, p. 69).

[2] Launched in 2019, the European Green Deal presents the roadmap for a sustainable economy in the EU. The ultimate goal of the Green Deal is to reach climate neutrality by 2050 (European Council 2025) .

From the above elaborations, **three research gaps** become evident. *First,* there is still little knowledge on the transformative potential of SMEs and how they can shape regional path development. *Second,* the transformative potential of the timber sector, or put differently, the question how the timber sector can contribute to sustainability transformation and sustainable regional development, rests underresearched. *Third*, knowledge on the drivers and barriers of sustainability transformation is fragmented.

Research questions

This dissertation addresses three **overarching research questions**, which follow from the research gaps elaborated above. These questions are:

(1) In what ways and to what extent can SMEs shape sustainability transformation?
(2) How can the timber sector promote sustainability transformation and sustainable regional development?
(3) What are the drivers and barriers of sustainability transformation in the timber sector?

These research questions are addressed by analyzing transformative SMEs[3] in the context of the timber sector in Switzerland (Bern) and Austria (Vorarlberg). Bern and Vorarlberg share social and cultural commonalities but their timber sectors differ in structure and performance: the Vorarlberg region is a hotspot of modern timber construction, and the case illustrates how the timber sector can contribute to sustainable regional development. Meanwhile, the Bernese timber sector struggles to remain economically viable and to contribute to regional value creation. Bern and Vorarlberg are thus two interesting cases for comparison (cf. chapter 4.2).

Aims and contributions

This thesis contributes to existing research in the fields of sustainability transformations and natural resource-based industries. It does so by combining ideas and concepts from evolutionary economic geography (EEG) and post-growth geographies. Hence the contributions are twofold: *First*, on an **empirical level**, the thesis examines the role of SMEs in sustainability transformations and illuminates how the timber sector can contribute to sustainable regional development. By empirically examining how SMEs can be transformative and through an international comparison of transformation in two regions, this dissertation shows how sustainability transformation unfolds in a region-specific and sector-specific context. *Second*, on a **theoretical level**, this thesis builds bridges between evolutionary economic geography and post-growth geographies by combining concepts from both research strands. Moreover, it defines the concept of transformative enterprise, which has the potential to address both schools of thought.

In this dissertation, sustainability transformation is studied drawing on concepts from **evolutionary economic geography (EEG)** and **post-growth geographies**, which both conceive

[3] This dissertation adopts the definition of SMEs by the Swiss Federal Office for Statistics. SMEs are defined as enterprises with less than 250 employees. SMEs with 1 to 9 employees count as micro-enterprises, SMEs with 10 to 49 employees are called small enterprises and SMEs with 50 to 249 employees are defined as medium-sized (Bundesamt für Statistik BFS 2019).

transformation as being shaped by the interplay between structure (or context) and agency (Boschma & Frenken 2006, p. 292, Schulz *et al.* 2020, p. 19). To study **structures**, EEG often uses the concept of regional innovation system (RIS) (Grillitsch & Sotarauta 2025, p. 109) and its recent revision called **challenge-oriented regional innovation system (CORIS)** (Tödtling *et al.* 2021). (CO)RISs consist of three key elements: actors, networks and institutions, which are embedded in the regional socio-economic institutional and cultural context (Asheim *et al.* 2019, p. 2). Compared to EEG, post-growth geographies do not provide conceptualizations of structure like (CO)RISs[4]. But importantly, post-growth geographies acknowledge that **diverse forms of innovation** are necessary to change existing structures (cf. Schulz *et al.* 2020, p. 26). **Agency** is studied in EEG by conceptualizing various types of agency, among them firm-level agency (addressing changes within a firm or organization) and system-level agency (concerned with broader regional adaptations) (Baumgartinger-Seiringer *et al.* 2020, p. 4). Post-growth geographies also assume that businesses have the potential to act as agents of change (Lange *et al.* 2024, p. 327), but they rather speak of their 'practice(s)' than of 'agency'. However, the concept of **change agent** is used in post-growth geographies and EEG alike to describe actors who induce change. The concepts of CORIS, diverse innovations, agency and change agent are used in this dissertation to study how transformation unfolds in the field of tension between individual agency and system-level restrictions.

By drawing on concepts from EEG and post-growth geographies, this dissertation seeks to address current discussions in **economic geography** which are increasingly turning towards sustainability matters and call for reconsidering normative assumptions and well-established concepts. As regards the **normative assumptions** underlying economic geography research, these often (implicitly) imply that quantitative growth is essential for positive development (Schulz *et al.* 2020, pp. 18, 26) and support a neoliberal agenda of (regional) development, leaving a profound engagement with questions of social equity aside (Martin 2021). Some economic geography scholars have therefore introduced ideas of post-growth into the discipline (Schulz 2012, Schulz & Bailey 2014, Schulz & Braun 2021, Lange *et al.* 2020). Others committed themselves to rethinking regional studies (Martin 2021) or the geographies of innovation (Binz & Castaldi 2024) while considering normative orientations, or called for a renewed research agenda that makes the compliance with planetary boundaries a priority topic (Chlebna *et al.* 2024). This engagement with normative questions led to the critical reevaluation of economic geography **concepts**. The well-known and widely applied concept of regional innovation system (RIS), for example, has recently been developed further: challenge-oriented regional innovation systems ought to better address place-based problems and needs beyond purely technocentric views of innovation and development (Tödtling *et al.* 2021, Isaksen *et al.* 2022).

Two central notions of this thesis – sustainability transformation and sustainable regional development – are understood in the context of these ongoing discussions on normative orientations in

[4] One could argue that sustainability transitions research, which inquires the inertia of unsustainable socio-technical alignments and trances transformation processes (Schmid 2020, p. 52), can be summarized under the banner of post-growth geographies too (cf. Schulz & Bailey 2014) and existing work sometimes draws on transition studies to explore profound socio-ecological transformations (e.g., Schmid 2020). Transition research provides a widely used concept called multi-level perspective (MLP) to study the interplay between different levels of structuration (niches, regimes and landscapes) (Geels 2011). In this dissertation, however, I follow Affolderbach & Schulz, p. (2024, p. 186), who consider transition research as separate from post-growth geographies. I see two important reasons for this differentiation: (1) Transition research is primarily focused on technological innovations and (2) much application of the MLP is in line with green economy approaches (Schmid 2020, p. 53).

economic geography. **Sustainability transformation**[5] is defined as systemic ecological, technological, economic, institutional and cultural changes towards modes of living, working and economic activity that do not exceed the ecological basis of the planet (Schneidewind 2019, p. 11, WBGU 2011a, p. 417). This definition of sustainability transformation aligns with voices acknowledging that a more radical transformation of the current economic system is needed to comply with planetary boundaries (e.g., Lange *et al.* 2020, Chlebna *et al.* 2024) because absolute decoupling of material throughput from economic output has not happened so far (Haberl *et al.* 2020) and green economy strategies[6] therefore do not hold what they promise. In my understanding[7], the definition of sustainability transformation used in this thesis covers the WCED's description of sustainability as meeting the needs of the present without compromising the ability of future generations to meet their own needs (WCED 1987, Wachter 2014, p. 13)[8] and even implies a notion of strong sustainability[9].

The understanding of sustainable regional development in this thesis is also inspired by calls to rethink normative orientations and approaches to regional development (Martin 2021, Schulz & Bailey 2014, Pike *et al.* 2007). Based on the Leibnitz Community's explanations on 'sustainable spatial development' (ARL - Akademie für Raumentwicklung der Leibniz-Gemeinschaft 2021, pp. 3–4) and the definition of 'transformative regional development' by Chlebna et al. (2023), **sustainable regional development** is defined as interventions that aim at increasing wellbeing in regions and pursue the goal of sustainability transformation (as defined before), thus emphasizing the content and direction of change. Sustainable regional development rests on an understanding of space which stresses the relations and exchanges between natural, social and economic spaces. From this follows that sustainable regional development is not only about economic growth and value creation, but that it addresses the integrated development of natural, economic and social spaces. Finally, the understanding of sustainable regional development is devoted to the idea of justice. This definition departs from most understandings

[5] 'Transition' is the twin concept of 'transformation', which is widely used in transition research. 'Transition' also involves *"'far-reaching changes along different dimensions: technological, material, organizational, institutional, political, economic, and socio-cultural' in the course of which 'new products, services, business models, and organizations emerge, partly complementing, partly substituting for existing ones'* (Markard *et al.* 2012, p. 956 in: Schmid 2020, p.52). In this thesis, I use the term 'transformation' because in my understanding sustainability transition research differs from post-growth geographies in terms of research focus and normative orientation (cf. footnote 4).

[6] The concept of the 'green economy' embraces decoupling material throughput from economic output by technological advances. Critics associate the green economy with conventional, growth-based capitalism and criticize it for reproducing existing structures is 'green disguise' (Schulz & Bailey 2014, p. 277). This thesis takes this critique seriously and proposes that more radical changes may be necessary for addressing current challenges.

[7] This dissertation was supervised by Prof. Dr. Heike Mayer and Prof. Dr. Irmi Seidl who also co-authored the research articles (chapters 5, 6 and 7). In the framework chapters of this thesis (chapters 1, 2, 3, 4, 8 and 9), I sometimes refer to the first person to state my personal interpretations or decisions.

[8] The definition of sustainability used in forestry, however, is narrower than the definition of sustainability transformation used in this thesis: In forestry, sustainability or sustainable yield (*forstliche Nachhaltigkeit* in German) circumscribes forest management practices, which take measures to reach a balance between timber increment and timber use (Heinimann & Teischinger 2024, p. 20f.).

[9] In sustainability economics, strong sustainability means that natural capital cannot be replaced with other forms of capital (human-made or social) (Stern 1997). More generally, strong sustainability is understood as primacy of ecological goals over social and economic ones.

of regional development[10], which assume that quantitative growth is essential for positive development (Schulz et al. 2020, pp. 18, 26).

Structure of the dissertation

This dissertation is structured in **three consecutive parts**, which build on one another and are depicted in Table 1: Part I lays the conceptual foundations of the dissertation by theoretically defining transformative enterprises. Part II examines sustainability transformation at the firm level by empirically investigating potentially transformative enterprises in the Bernese timber sector. Part III illuminates transformative changes on a regional level by comparing transformation trajectories of the Bern and Vorarlberg timber sectors. This procedure in three parts followed the logic of first defining the object of research before exploring transformation at different levels, which has also been applied in a recent anthology on sufficiency in business (Gossen & Niessen 2024).

From the three consecutive parts of the dissertation resulted **three research articles** (overview in Table 2). The dissertation's findings are gained by synthesizing the findings of these three articles. The **first research article** develops a definition of transformative enterprises. Based on a literature review, it identifies nine key dimensions of such enterprises and defines a set of 30 indicators for describing them. The article also shows that the nine key dimensions and the corresponding indicators either relate to firm-level agency (business strategies and changes which concern the firm-internal realm) or system-level agency (business strategies which target the business and social environment of the firm). The **second research article** analyzes whether and how SMEs in the timber sector can become agents of change in sustainability transformations. To do so, it empirically applies the concept of transformative enterprises to 24 wood-processing SMEs in the Canton of Bern and describes five enterprise types which differ regarding their change agency and the actor roles they take. The second research article moreover identifies limits of change agency potentially transformative SMEs encounter. The **third research article** investigates how the wider system enables or impedes transformative change by drawing on a comparison of the timber sector in Bern (CH) and Vorarlberg (AUT). The article uses the concept of challenge-oriented regional innovation system to illuminate system-level change agents, networks and institutions which foster the integration of sustainability challenge into the regional innovation system.

The dissertation's **findings** indicate that SMEs can indeed contribute to sustainability transformation if they align their business with ecological and social values. Moreover, it is shown that the timber sector has transformative potential: it can promote sustainability transformation through regional value creation, by providing local jobs or by supporting a lived building culture and transmitting the values of ecology and craftmanship. The results also demonstrate that resourceful individuals who

[10] Even though regional development is generally associated with measures to stimulate economic growth, alternative understandings are increasingly important and start influencing policy: In Switzerland for example, the policy for regional development, called New Regional Policy (NRP), integrated sustainable development, local economy and digitalization as cross-cutting themes in its implementation programs in 2024 (see Meili & Mayer 2024). This can be seen as a step towards sustainable regional development as defined in this thesis. In Germany, the concept *Wirtschaftsförderung 4.0* (Wf4.0) is now tested in several communities. Wf4.0 aims at contributing to a 'Great Transformation' (cf. WBGU 2011a) and strengthens regional resilience through supporting regional value chains and economies for the common good. Moreover Wf4.0 considers the 'whole economy', i.e., all facilities and actions that serve the planned satisfaction of needs, is now tested in several communities (Kopatz 2021, pp. 20–27).

act as change agents are important enablers of change agency. But at the same time, change agents encounter many limits of change agency. **Future research** should deepen the knowledge on the transformative potential of SMEs (e.g. with more empirical case studies, insights from different industries and geographical contexts and by comparing SMEs to larger enterprises). Besides that, the transformative potential of other sectors could be studied and more investigations on the limits and enablers of sustainability transformation are necessary. Finally, a few **policy implications** for the Bernese timber sector can also be derived from this thesis: measures addressing the societal, political and sectoral framework conditions should be taken to support sustainability transformation, and transformative enterprises may need specific support to unfold their potential.

Table 1: Summary of the three parts of the dissertation.

	Part I	**Part II**	**Part III**
Description	CONCEPTUAL FOUNDATIONS	EMPIRICS I	EMPIRICS II
Goals	• Define transformative enterprises	• Identify transformative characteristics & practices in SMEs • Identify limits of change agency	• Compare transformation trajectories • Evaluate potential impact of transf. enterprises / change agents on larger system
Overarching questions	(1) In what ways and to what extent can SMEs shape sustainability transformation? (2) How can the timber sector promote sustainability transformation and sustainable regional development? (3) What are the drivers and barriers of sustainability transformation in the timber sector?		
Specific research questions	• What operationalizable characteristics that refer to transformative enterprises are discussed in the literature? • How can we define transformative enterprises?	• What characteristics and micro-level practices define types of potential agents of transformative change in the wood-processing industry? • What is these SMEs' capacity to exert change agency regarding sustainability transformation?	• What elements (actors, networks, institutions) of the RIS around the Vorarlberg and Bernese timber sector enhance challenge orientation? • Who exerts system-level change agency and how does this agency manifest?
Concepts	Transformative enterprise Agency (firm-level & system-level)	Transformative enterprise Agency (firm-level & system-level)	Challenge-oriented regional innovation system Agency (system-level)
Method	Literature review	Firm inventory (potentially transformative enterprises; based on definition in part I) Firm interviews	Literature review Expert interviews
Geographical context	-	Canton of Bern (CH)	Canton of Bern (CH) Province of Vorarlberg (AUT)
Perspective	Firm level	Firm level	Regional level

The next chapter (2) presents the theoretical background of this dissertation. After a brief description of evolutionary economic geography and post-growth geographies, key concepts are discussed. Chapter 3 illustrates the research design and methods. Chapter 4 introduces the empirical context of the timber sector and describes why the Bernese and Vorarlberg timber sector are two

interesting cases for comparison. The research articles are presented in chapters 5, 6 and 7. Chapter 8 synthesizes the findings of the research articles and discusses three overarching themes – the transformative potential of SMEs, the transformative potential of the timber sector and drivers and barriers of sustainability transformation – which emerged from the articles. Chapter 9 closes with an outline of the dissertation's contributions, considerations of limitations and future research and some thoughts on policy implications.

Table 2: Overview of research articles.

Article number and title	Research questions	Authorship	Methodology	Status
1 – Transformative enterprises: Characteristics and a definition	• What operationalizable characteristics that refer to transformative enterprises are discussed in the literature? • How can we define transformative enterprises?	Miriam Hug Heike Mayer Irmi Seidl	Literature review	Published in: Hug, M., Mayer, H., & Seidl, I. (2022). Transformative enterprises: Characteristics and a definition. *Geography Compass*, 16(12), 1–21.
2 – Transformative firm-level agency: A case study of small and medium-sized enterprises (SMEs) in the Swiss wood-processing industry	• What characteristics and micro-level practices define types of potential agents of transformative change in the wood-processing industry? • What is these SMEs' capacity to exert change agency regarding sustainability transformation?	Miriam Hug Heike Mayer Irmi Seidl	Firm inventory; semi-structured firm interviews (24)	Published in: Hug, M., Mayer, H., & Seidl, I. (2024). Transformative firm-level agency: A case study of small and medium-sized enterprises (SMEs) in the Swiss wood-processing industry. *Progress in Economic Geography*, 2(2), 1–14.
3 – How regional innovation systems (RIS) integrate sustainability challenges: RIS reconfiguration in the timber sector	• What elements (actors, networks, institutions) of the RIS around the Vorarlberg and Bernese timber sector enhance challenge orientation? • Who exerts system-level change agency and how does this agency manifest?	Miriam Hug Irmi Seidl Heike Mayer	Expert interviews (23); Document analysis	Submitted to: *Regional Studies Regional Science*, under review

2 Theoretical background

This dissertation positions itself at the intersection of **evolutionary economic geography** (EEG) and **post-growth geographies**. The two approaches share an interest in transformation processes, which they conceive as being shaped by the interplay between structure and agency (Boschma & Frenken 2006, p. 292, Schulz *et al.* 2020, p. 19). Moreover, both approaches ascribe agency to actors who are seen as key drivers of change (Boschma & Martin 2010, pp. 11–13, Mayer *et al.* 2021b). Apart from these common ontological assumptions, evolutionary economic geography and post-growth geographies differ in their normative orientation. While EEG adheres to an understanding of economic development which (implicitly) rests on the premise of economic growth (Donald & Gray 2019, Schulz & Bailey 2014), post-growth geographies explicitly state that a fundamental **transformation** involving systemic ecological, technological, economic, institutional, and cultural changes towards modes of living, working and economic activity that do not exceed the ecological basis of the planet (Schneidewind 2019, p. 11), is necessary.

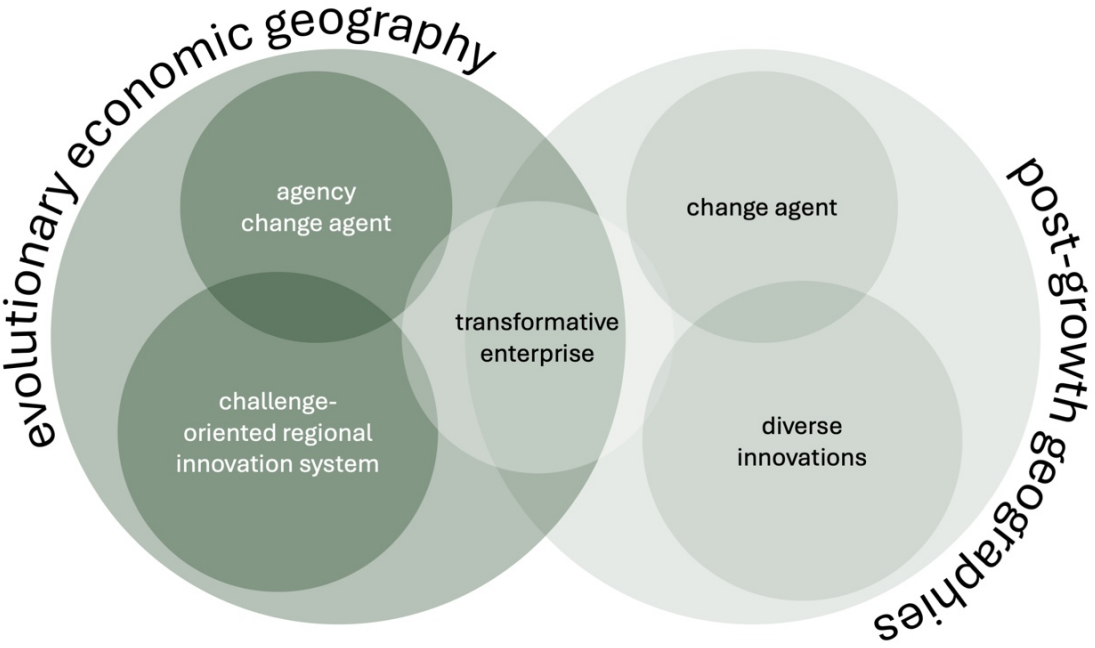

Figure 1: Positioning of the dissertation in economic geography and key concepts used.

As shown in Figure 1, the research conducted in this dissertation seeks to **build bridges** between the two schools of thought: it adheres to the explicit normative orientation of post-growth geographies. At the same time, it uses concepts from evolutionary economic geography (agency, change agent and challenge-oriented regional innovation system) and puts them in dialogue with their equivalent in post growth geographies (change agent and diverse innovations). The concept of transformative enterprise, which was defined in this dissertation, takes up elements of post-growth thinking and EEG and therefore bridges the two schools of thought. The decision to draw on well-known, widely applied concepts from EEG was on the one hand pragmatic and may facilitate tying in with policy debates (especially in the case of regional innovation systems). On the other hand, the dialogue I sought with concepts from post-growth thinking allows the introduction of post-growth ideas into EEG and could provoke critical

reflection. Even though some post-growth activists may argue that the two theoretical strands cannot be reconciled because of their normative differences, I rather see the potentials of a dialogue lying in common ontological assumptions. These bridging potentials may reform traditional EEG thinking and indicate ways to readjust the prevailing economic system (cf. Schulz & Braun 2021, p. 214). The concepts used in this thesis both illuminate the role of individual change agents and explore transformation at the regional level. Equally, they help to identify enabling and constraining factors of transformative change. In what follows, I briefly explain the contours of evolutionary economic geography (chapter 2.1) and post-growth geographies (chapter 2.2) and then present the key concepts of the dissertation in chapters 2.3 to 2.5.

2.1 Evolutionary economic geography

Evolutionary economic geography (EEG), a branch of economic geography which gained visibility in the 2000s, seeks to explain current realities from **history** and emphasizes assets, skills and competences developed in the past, which influence present and future choices and possibilities (Baumgartinger-Seiringer *et al.* 2020, p. 2). Hence, economic change is neither seen as deterministic nor accidental but as influenced by historic and place-specific developments (Bathelt & Glückler 2018, p. 376). In brief, EEG aims at demonstrating *"how geography matters in determining the nature and trajectory of evolution of the economic system"* (Boschma & Martin 2010, p. 6). In EEG thinking, it is the dynamic **interplay between structure and agency** that produces the evolution of real places (Boschma & Frenken 2006, p. 292). From this follows that the role of the spatial and institutional context for economic development as well as human agency (Grillitsch & Sotarauta 2025) are focal points of analysis. Other key propositions of EEG are methodological pluralism (formal modelling but also qualitative case studies are used) and a dynamic conception of time (the spatial evolution of new sectors or networks is a dynamic process) (ibid., p. 291ff.). What's more, EEG is interested in different levels of aggregation: while firms are the micro-unit of analysis, EEG also addresses the meso-level by studying the spatial evolution of sectors and networks and explores the macro-level with research on structural change (ibid.).

Structure and **agency** are two central notions in EEG. The term structure goes back to Giddens structuration theory where it refers to *the logics, limitations and systems of society* (Gregory *et al.* 2009, p. 726). The notion of **context** is also frequently used in EEG studies. Context can be understood as a subset of structure and may be defined as *"the wider [social, cultural and institutional] settings (subject to changes) in which key objects and events are embedded (for example, in specific regions, countries, time periods etc.)"* (Gong & Hassink 2020, p. 476). Since a few years, EEG has also paid increasing attention to agency. **Agency**, that is *"the ability of people to act, usually regarded as emerging from consciously held intentions, and as resulting in observable effects in the human world"* (Gregory *et al.* 2009, p. 347), can transform structures or context but is also contingent on those structures (Grillitsch & Sotarauta 2025, p. 115). In the context of regional development, agency can be conceived as the capacity of individuals, groups or organizations "*to act purposefully and significantly in pursuit of desired futures for their regions"* (ibid., p.105). Chapter 2.4. will discuss the concept of agency in more detail.

Path development is a key concept in EEG that has been used in combination with other concepts such as regional innovation systems or agency. Path development describes *"how the development of*

new economic activities takes place in regions" (Hassink *et al.* 2019, p. 1636) and is mostly depicted as a firm-driven process (Baumgartinger-Seiringer *et al.* 2020, p. 2). Different types of path development have been identified, for example new path creation (the rise of new industries), path importation (attraction of established industries from outside the region), path diversification (moves into a new industry) or path renewal (major change of an existing regional path) (ibid.). In the context of sustainability transformations, which are of interest in this dissertation, the notion of **green path development** has been introduced to describe the rise of new green industries or the "greening" of existing ones (Trippl *et al.* 2020, p. 189). The concept of path development is frequently used in combination with the concept of **regional innovation systems (RIS)**, which dates back to the 1990s (Asheim *et al.* 2019), and more recently with **challenge-oriented regional innovation systems (CORIS)** (Tödtling *et al.* 2021). Reasons for this 'import of concept' are the commonalities between RIS and EEG thinking (Hassink & Klaerding 2011, p. 142f.), the influence of the RIS concept on policy making (Coenen *et al.* 2017) and its clear analytical framework. In recent years, studies of path development have also been combined with the concept of **agency** to better understand how economic actors create, recreate and alter paths (Hassink *et al.* 2019, p. 1638).

EEG thinking influences this dissertation, which draws on the concepts of path development, agency and CORIS (cf. chapters 2.3 & 2.4). Moreover, the dissertation refers to EEG's understanding of structure and agency. But even though EEG increasingly engages with environmental matters, I see two major points of criticism: EEG draws on an understanding of development which rests on the premise of economic growth (Donald & Gray 2019). What is more, the concept of green path development is based on the idea of a "green economy", which embraces decoupling material throughput from economic output by technological advances. However, the feasibility of absolute decoupling is questionable (Haberl *et al.* 2020). In contrast to EEG, post-growth geographies explicitly address the need to stay within planetary boundaries. Therefore, ideas and concepts from post-growth geographies were taken up to complement the theoretical framework. The following section circumscribes post-growth geographies and highlights which ideas and concepts were relevant for this thesis.

2.2 Post-growth geographies

Post-growth geographies are an emergent research strand that encompasses a diversity of ideas and topics (Schulz *et al.* 2020, p. 21, Demaria *et al.* 2019) and can be situated in the broad field of transformation research (Heyen & Brohmann 2017, p. 70f., see also Wittmayer & Hölscher 2017)[11]. Post-growth geographies are – as the name tells us – inspired by ideas of post-growth. **Post-growth**[12] is

[11] Post-growth geographies are related to other strands of the literature, namely to the concept of 'diverse economies' (Gibson-Graham 2008) and 'alternative economies' (Zademach & Hillebrand 2013). The three literatures share (1) a common ground on the empirical phenomena studied, (2) a critique of the reductionist view on 'the' economy (as expressed for example in GDP monitoring and economic development policies), and (3) a fundamental concern regarding the capitalist principles leading to growth fixation and its socio-ecological impacts (Schulz & Braun 2021, p. 214).

[12] Post-growth has sometimes also been called degrowth. In the early 2010s, degrowth proponents aimed at intentionally downscaling economic activities (Van Den Bergh & Kallis 2012), whereas post-growth highlighted growth independence (Seidl & Zahrnt 2010). Schmelzer & Vetter (2019, p. 17) claim that the terms degrowth

an emerging concept and rather describes an umbrella key word (Kallis 2011, p. 874) than a unified field. A common denominator of post-growth thinking is its critique of the growth-based mechanisms and motivations driving the prevailing economic system. This critique has recurred since the report of the Club of Rome on the *limits to growth* in 1972 (Meadows *et al.* 1972, Schulz & Bailey 2014, p. 278). Post-growth does not intend to ban growth as such but *"critically reflects on what kinds of activities are necessary for assuring social wellbeing"* (Schulz & Braun 2021, p. 214, see also Martínez-Alier *et al.* 2010, p. 1742). Proponents of post-growth posit that purely technology-based approaches are not far-reaching enough for tackling current environmental and social problems. Particularly, finite resources and the negative implications of continuous material growth imply that profound socio-economic changes aiming at growth independence, resource use within planetary boundaries and social well-being are necessary (Schmelzer & Vetter 2019). Hence, the idea of sufficiency[13] is a central component of post-growth thinking. Moreover, post-growth scholars often emphasize strong sustainability.

In **economic geography**, post-growth thinking is gaining visibility since the 2010s (Schulz 2012, Schulz & Bailey 2014). However, (mainstream) economic geography's engagement with post-growth has so far remained accidental, despite its potentials to contribute to post-growth debates (Schulz & Bailey 2014, p. 287). Affolderbach & Schulz (2024, p. 231ff.) identify five fields of application of post-growth in economic geography, which are the dematerialization of production and consumption, sufficiency (cf. Schneidewind & Zahrnt 2017) and the qualitative assessment of growth, new forms of corporate organization and democracy, the world of work (cf. Seidl & Zahrnt 2019), and financing. So far, post-growth practices have mostly been examined at the local level (Affolderbach & Schulz 2024, p. 240). Recent contributions cover for example sharing economies (e.g., Affolderbach & Médard de Chardon 2021) and community economies (Schmid 2020), social innovations and growth independence (Tschumi *et al.* 2020), working-time reduction in small business (Eichmann 2020), or the financing of post-growth (Dörry & Schulz 2018).

Even though post-growth geographies are far from being a consolidated research field, four **common features** of **geographical post-growth research** can be identified. *First,* geographical approaches to post-growth are interested in the interplay of different **levels** of transformation and the connections between practices and actors. Post-growth oriented economic practices are understood as embedded in higher levels of policy and actions, and as connected to other practices and actors (Schulz *et al.* 2020, p. 21). *Second,* post-growth geographies share a broader understanding of **'the' economy**, meaning that not only formal enterprises acting along the principles of the market are of interest, but also social and solidary economies (e.g. (eco-)social enterprises) and (unpaid) private and communitarian activities (ibid., p.18f.)). Likewise, and *third,* post-growth geographies posit that the common understanding of **regional development**, which assumes that quantitative growth (e.g. in labor

and post-growth may be used interchangeably as both aim at growth independence, resource use within planetary boundaries and social well-being. This dissertation does not differentiate between degrowth and post-growth but for reasons of consistency uses the term post-growth.

[13] Sufficiency is often translated with *frugality*. The sufficiency approach asks what material economy is necessary to ensure social prosperity (Affolderbach & Schulz 2024, p. 234). There is no universally accepted definition of sufficiency (Jungell-Michelsson & Heikkurinen 2022) but one possible way to understand sufficiency is as *"a strategy for reducing the consumption and production of end-use products and services through changes in social practices in order to comply with environmental sustainability while ensuring an adequate social foundation for all people"* (Lange *et al.* 2024, p. 325).

markets, population, company turnover, investments in infrastructure) is the most important driver of positive development (ibid., p.18, 26), must be reconsidered. *Fourth,* thinking (regional) development differently also entails an understanding of **innovation** beyond technology and consideration of other forms of innovations such as social innovations (ibid., p.26) or slow innovations (Mayer 2020).

This dissertation's research is informed by the above-mentioned four common features or starting points of post-growth geographies. While the interest of geographical post-growth research resonates with the focus on structure-agency relations in EEG, the broadened conception of the economy, regional development and innovation in post-growth geographies are additions to an EEG perspective. In the following three chapters, I explain the key concepts used in this dissertation – challenge-oriented regional innovation systems, agency and change agent, and transformative enterprise – and show how they bridge EEG and post-growth thinking.

2.3 Challenge-oriented regional innovation systems

For studying the structural and systemic dimensions of sustainability transformations, this dissertation uses the concept of **challenge-oriented regional innovation system (CORIS)** (Tödtling *et al.* 2021), a recent further development of the concept of regional innovation system (RIS). CORIS integrates the idea that diverse innovations and actors are necessary for tackling current challenges, thus taking up a claim of post-growth geographies. CORIS analyzes the three key elements of a RIS, that are **actors, networks** and **institutions**[14], and the systemic interdependencies between them (Asheim *et al.* 2019, p. 2). Figure 2 below shows that these actors, networks and institutions can be situated in all three subsystems of a RIS, the production subsystem, the knowledge generation and diffusion subsystem, and the policy subsystem. Figure 2 moreover illustrates that RIS subsystems are embedded in a broader socio-economic institutional and cultural context. This context includes the institutional framework, i.e., the regional set of formal rules and informal norms that enables or constrains the functioning of a RIS (ibid., p.2-3). Hence, RIS are strongly anchored in specific socio-cultural settings but at the same time depend on what happens outside the system's territorial boundaries (ibid., p.3).

The CORIS concept makes three important **additions to traditional notions of RISs**. *First,* CORIS is attentive to previously overlooked **innovation actors** like civil society groups, public sector actors, municipalities, users and citizens, and new types of networks and institutions (green boxes in Figure 2). These actors are recognized as playing a key role in the development, application and scaling of innovative solutions for territorial challenges (Trippl *et al.* 2024a, Trippl 2023). *Second,* the CORIS concept extends the conventional focus of RISs on technological innovation in the firm sector to

[14] Institutions can be defined as *"the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights)"* (North 1991, p. 97). Institutions enable or constrain economic development or transformation in spatially differentiated ways (Martin 2000, p. 79). In RISs, they play three essential roles that are: reducing uncertainty by providing information, managing conflicts and promoting cooperation and providing incentives for innovation (Asheim *et al.* 2019, p. 14).

encompass **diverse forms of innovation** such as social[15], institutional[16] or user[17] innovations (Trippl *et al.* 2024a). *Third,* a CORIS perspective is attentive to processes of **RIS reconfiguration**, that is, changes in RIS aiming at the integration of sustainability challenges (Trippl *et al.* 2024b). Here, reorientation and transformation are identified as two ideal-typical routes of RIS reconfiguration (Isaksen *et al.* 2022). The reorientation route mobilizes assets, actors, networks and institutional structures of existing RISs to pursue new goals, while the transformation route is characterized by the creation of new challenge-oriented structures along with the destruction of old, unsustainable ones. The transformation route includes new innovative actors, it forms new networks and induces institutional change processes (Trippl *et al.* 2024b, p. 5). In RIS reconfiguration, system-level agency is considered an important force (Trippl *et al.* 2024a, pp. 6–7). In summary, CORIS can be defined as *"(those parts of) RISs that feature challenge orientation"* (Tödtling *et al.* 2021, p. 6).

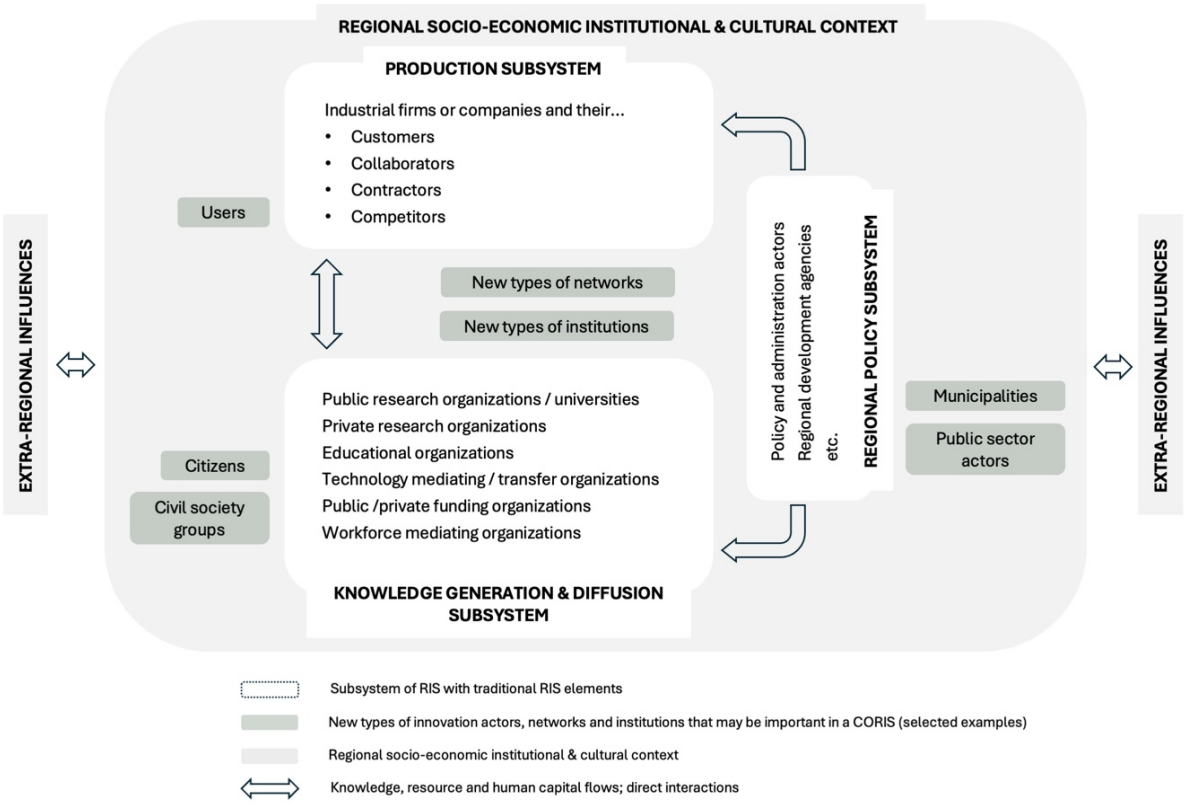

Figure 2: The structure of a CORIS (adapted from Tödtling & Trippl 2005, p. 1206).

[15] Social innovations are new forms of collaborations at the individual or organizational level that lead to novel ideas that are at least considered for implementation. Social innovations may positively affect society, improve the quality of life and change social or power relations (Tschumi *et al.* 2020, p. 120).

[16] Institutional innovations are defined as *"novel, useful, and legitimate change that disrupts, to varying degrees, the cognitive, normative, or regulative mainstays of an organizational field"* (Raffaelli & Glynn 2015). Hargrave & Van de Ven (2006) moreover emphasize that institutional changes which are "novel or unprecedented from the past" (p.866) represent institutional innovations.

[17] User innovation is new product and service development (or improvement) by intermediate users (e.g. firms) or consumers (individuals or communities) rather than by suppliers (producers, manufacturers) (Bogers *et al.* 2010, Von Hippel 2016).

The CORIS concept is useful in this dissertation not only because of its clear analytical framework, which can be combined with the concept of system-level agency, and the fact that (CO)RIS can be a *"helpful boundary-spanner between academic analyses and policy practice"* (Coenen *et al.* 2017, p. 601) (RISs are also part of the Swiss New Regional Policy, cf. Meili & Mayer (2024)). In my understanding, CORIS also integrates some features of post-growth geographies: the CORIS concept was developed upon the observation that conventional RIS studies mainly focus on innovation in the firm sector and that the concept fails to address grand challenges such as climate change or economic distortions (hence the label *challenge-oriented*). CORIS therefore departs from the purely technocentric view, which so far dominated RIS studies, and puts place-based problems and needs center stage. The latter are also a key concern of post-growth geographies, which often analyze localized economic practices (Affolderbach & Schulz 2024, p. 240). Moreover, CORIS's emphasis on diverse types of actors and innovations is an aspect which resonates with post-growth geographies' broadened understanding of economic activity and its focus on diverse innovations (cf. Schulz *et al.* 2020, p. 26).

2.4 Agency and change agents

The concepts of **agency** and **change agent** are used in this dissertation to examine whether and how SMEs in the timber sector can initiate change towards deep-seated sustainability transformation. Agency[18], as defined in chapter 2.1, can aim at inducing changes – for example by challenging dominant narratives (Grillitsch & Sotarauta 2025, p. 19) – and is then called **change agency**. Agency oriented towards preserving existing structure is called **maintenance agency** (Grillitsch & Sotarauta 2019, p. 4) (or sometimes also reproductive agency, cf. Bækkelund (2021)). Individuals, groups or organizations – among them firms – can exert agency. In the literature, firms that mindfully deviate from existing structures are depicted as important bearers of change agency (Hassink *et al.* 2019, p. 1638). Scholars have therefore introduced the notions of **firm-level agency** and **system-level agency**, which are used in this thesis: *"While firm level agency is mainly concerned with changes within a firm or organisation, system level agency is geared towards broader regional adaptations"* (Baumgartinger-Seiringer *et al.* 2020, p. 4). Firm-level agency is sometimes also called organizational-level agency because it can be exerted by other actors than firms (Blažek & Květoň 2022, p. 3). Together with these different versions of agency, agency studies frequently use the notion of **change agent** (e.g., Kyllingstad & Rypestøl 2019). The latter is also common in transformation and post-growth research and defined as *individuals or groups with a crucial role in initiating, designing, and implementing change* (Kristof 2010, WBGU 2011a, p. 419).

The EEG literature provides a few hints about **activities** or **practices,** i.e. the actions of *doing* something (Brown & Williams 2000, p. 967), through which **firm- or system-level agency** unfolds. The introduction of new technologies, market expansion, product diversification, research activities, or new business relations are for example described as firm-level agency (Blažek & Květoň 2022). System-level agency, which often targets changes in institutions (Grillitsch *et al.* 2022, p. 255), is said to manifest through networking activities, lobbying, mediating, organizing events or participating in public debates (Blažek & Květoň 2022) as well as collective vision building and policy design and implementation (Trippl *et al.* 2024a). Because these concrete descriptions of firm- and system-level

[18] For an extensive discussion on the definition of agency see Emirbayer & Mische (1998).

agency still remain relatively superficial and say little about the role of enterprises in systemic transformations, the concept of transformative enterprise is used in this dissertation to complement existing accounts of agency in EEG (cf. chapter 2.5 and chapter 6 on pp. 62-64)

In **EEG**, the concept of agency has increasingly been used because structural accounts were not sufficient to explain the micro-level of path development processes (Grillitsch & Sotarauta 2019, p. 2). EEG scholars now recognize that agency is necessary for the reproduction and transformation of socially produced structures (Grillitsch & Sotarauta 2025, p. 105), and agency studies are said to be particularly suitable to capture time and space context (ibid., p.109). In consequence, agency perspectives hold the promise to explain **transformation processes**. Moreover, **regional differences in wellbeing** and **development pathways**, i.e. why regions with similar preconditions vary in their development, are frequently studied drawing on the concept of agency (ibid. p. 104). These two fields of application coincide with the questions addressed in this dissertation.

Agency and change agents are also central to **post-growth geographies**, which are based on the premise that humans can change underlying economic structures through their agency. The term 'agency', however, is more common in EEG than in post-growth geographies, which often use the notion of 'practice(s)' instead (e.g., Schulz & Bailey 2014, Schmid 2020, Gibson-Graham 2008). In my view, practices can be understood as the activities through which different forms of agency unfold. Post-growth geographies for instance describe alternative economic practices such as community gardening, sharing, cooperative and self-organized housing etc. (Affolderbach & Schulz 2024, p. 240). Such practices could result in change agency. The focus on actors and agency is thus rather implicitly covered in post-growth geographies because they are included in the research topics and themes examined.

In summary, the concepts of agency and change agent speak to EEG and post-growth geographies, which both ascribe agency to actors. EEG uses the concept of agency that captures what *results* from specific activities (changes in a firm or organization, for example, result from firm-level agency and broader regional adaptations result from system-level agency). Meanwhile, post-growth geographies refer to the notion of practice(s) to study what actors actually *do.* The concept of agency thus puts the focus on the *results* of action while the concept of practice describes the *moment of doing*. This dissertation uses the concept of agency in all three research articles. Moreover, the description of the nine key dimensions of transformative enterprises (first research article, cf. chapter 5) refers to enterprise practices[19]. The concept of change agent, which is also used in this thesis, is frequent in EEG and post-growth geographies alike. In their common interest in change agents and in the question what individuals or organizations do to induce changes I see great potential to bridge EEG and post-growth geographies across normative differences.

2.5 Transformative enterprises

This dissertation developed and used the concept of **transformative enterprise** to study the characteristics of firms that may contribute to a transformation towards sustainability. In the first part of the dissertation, transformative enterprises were defined based on enterprise characteristics mentioned in the literature (cf. chapter 3.4). Transformative enterprises are understood as:

[19] This thesis does not expand further on the differences and commonalities between the concepts of agency and practice and the implications of their use. Future research could take up this question.

„…pioneering SMEs who strive for fundamental changes towards sustainability. They have a social and/or ecological (1) driving mission and are oriented along the values of (2) stability and autonomy. Inside the enterprise, they implement these values through minimizing their (3) ecological footprint, assuming (4) social obligations, introducing (5) participatory governance structures, and offering (6) alternative products and services. The enterprise's core values define how it interacts with stakeholders: transformative enterprises put (7) people before profit, emphasize (8) regional embeddedness and act as (9) change agents. By spreading their vision and taking initiative for industry changes, they trigger or facilitate transformation processes and thereby contribute to sustainable, future-proof economic practices" (Hug *et al.* 2022, p. 11).

This definition of an idea-typical transformative enterprise contains nine key dimensions. Key dimension one to seven can be attributed to firm-level agency, i.e. they describe characteristics resulting from agency addressing changes within a firm or organization (Baumgartinger-Seiringer et al. 2020, p. 4). Key dimensions eight and nine[20] describe characteristics that may foster system-level agency, that is, agency geared towards broader regional adaptations (ibid.) (see Figure 3). Each key dimension is moreover specified with two to five indicators, which can be operationalized, e.g., in interview questions. To avoid repetitions, key dimensions and indicators are not described in detail here. Their comprehensive description is presented in the first article resulting from this dissertation (Hug et al. (2022), see chapter 5).

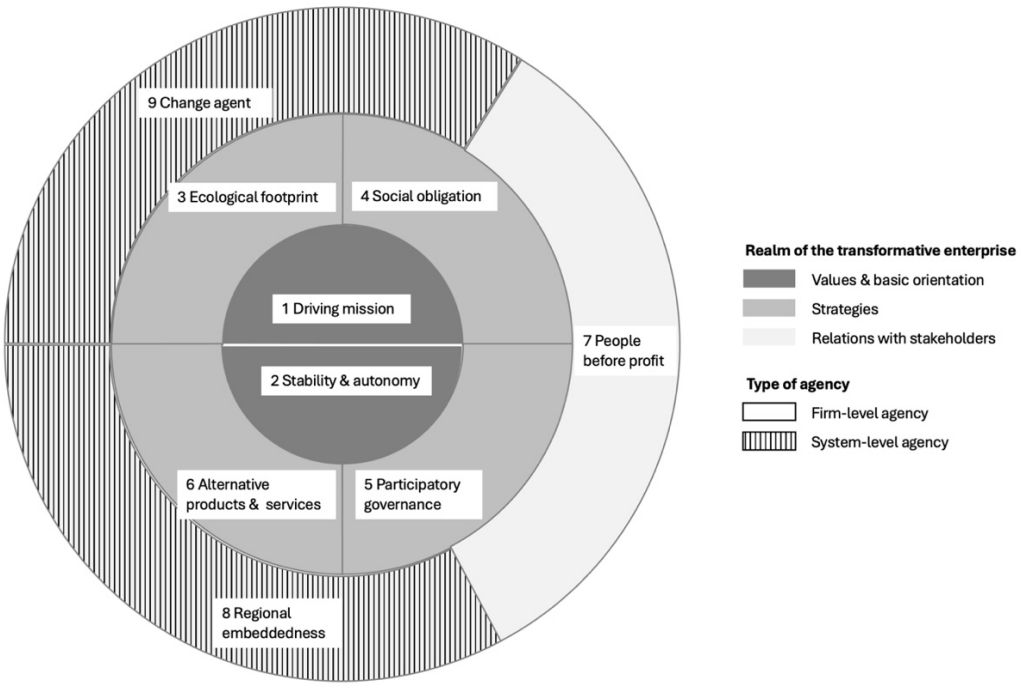

Figure 3: Key dimensions of transformative enterprises.

[20] Because key dimension nine is named "change agent", confusion could arise: one could follow that change agents are only change agents if they exert system-level agency. However, this is not the case. As defined in chapter 2.4, change agents have a crucial role in initiating, designing and implementing change, be it at the level of an organization, a firm, a system or elsewhere.

The concept of transformative enterprise as defined above to some extent **summarizes** what others have already done. But because the literature on enterprises in deep-seated sustainability transformations is thin, findings are dispersed and oftentimes difficult to operationalize systematically (e.g., for interview questions or a questionnaire), it was deemed necessary to define the concept more clearly. The term *transformative enterprise* appeared in the German-speaking research community (e.g., Pfriem 2021, Scholl & Mewes 2015, Pfriem *et al.* 2015) and – to my knowledge – has not (yet) gained currency outside[21]. Other scholarly contributions addressing the characteristics of SMEs aiming at strong sustainability or sufficiency are mostly from the field of post-growth. The most comprehensive definitions are provided by Khmara & Kronenberg (2018), Nesterova (2020), Hankammer *et al.* (2021), Hinton (2021) and Bruckner (2024). The concept of transformative enterprise summarizes the enterprise characteristics mentioned in these contributions.

In the literature, many **different labels** for enterprises aiming at deep-seated sustainability transformations are used, ranging from *future-proof enterprise* (Posse 2015), *growth-neutral enterprise* (Deimling 2016, Liesen *et al.* 2013), *post-growth business* (Hinton 2021), *degrowth company* (Khmara & Kronenberg 2018) and *degrowth business* (Nesterova 2020) to *common-good-oriented company* (Wiefek & Heinitz 2018) or *transformative enterprise.* Moreover, the terms *green entrepreneur* (e.g., Gibbs & O'Neill 2014) or *ecopreneur* (Affolderbach & Krueger 2017) are popular in economic geography. In this dissertation, I decided to summarize the above-mentioned work and to use the term *transformative enterprise*. This concept stresses the transformative aspect, and the nine key dimensions defining it are relatively easy to operationalize in interview questions. What is more, I deliberately did not use the term *green entrepreneur* or *ecopreneur*. This is because the discourses on green entrepreneurship, especially those in policy, only propose incremental changes without fundamentally questioning the dominance of economic paradigms and business models (O'Neill & Gibbs 2016, p. 1730).

The concept of transformative enterprise, which is central to this dissertation, lies at the **intersection** between **evolutionary economic geography** and **post-growth geographies** and has the potential to speak to both research traditions (cf. Figure 1). In EEG, the concept provides a micro-perspective on firms, e.g., an account of a firms' visions, governance structures, products and services sold etc., which has so far been missing (e.g., Hassink *et al.* 2019, Jolly *et al.* 2020). At the same time, this micro-perspective specifies sustainability-related practices which can lead to firm-level and system-level agency (see chapter 2.4). In post-growth geographies, the concept of transformative enterprise is useful for researching sustainability-related entrepreneurship, which has so far been conceptualized under many different labels.

In conclusion, this dissertation draws on ideas from EEG and post-growth geographies. The theoretical contribution lies in the use of **bridging potentials** between the two schools of thought. These bridging potentials are as follows. *First*, EEG and post-growth geographies are both interested in transformation processes, which they conceive as being shaped by the interplay between structure and

[21] The term *transformational entrepreneurship*, on the other hand, is used in the English-language literature on management and entrepreneurship (cf. Maas & Jones 2019). Like the concept of transformative enterprise, transformational entrepreneurship stresses that entrepreneurship needs to be seen from a more holistic perspective and address societal needs, including current global trends (ibid, p.2-6). However, the concept rests on a broader definition of transformation as it does not explicitly address the need to stay within planetary boundaries.

agency. *Second,* the concept of challenge-oriented regional innovation system integrates central concerns of post-growth geographies, i.e. the focus on place-based problems and the notion of diverse innovations. This may facilitate a dialogue between EEG and post-growth geographies. *Third,* EEG and post-growth geographies alike attribute agency to actors and assume that these are important change agents in transformation processes. Therefore, the concept of change agent is a frequently used in both schools of thought. EEG moreover uses the concept of agency and post-growth geographies refer to practices to describe what results from change agents' activities and what change agents do. *Finally,* the concept of transformative enterprise as defined in this dissertation is a bridging concept between EEG and post-growth geographies: it takes up enterprise characteristics discussed in the field of post-growth and combines them with the notion of firm- and system-level agency, which is frequently used in EEG. Hence the concept can speak to both research strands. After this discussion of the theoretical and conceptual cornerstones of this dissertation, I will turn to the research design in the next chapter.

3 Research design

The choice of a research design is informed by the general **worldview**[22] of the researcher, the **strategies of inquiry** (e.g. qualitative case studies vs. quantitative experiments) and the specific **research methods** (Creswell 2009a, pp. 3–5). In the case of this dissertation, the project organization moreover shaped the research design. In what follows, I elaborate on these aspects, starting with the project organization in chapter 3.1 and then continuing with the worldview, the strategies of inquiry and the research methods (chapters 3.2 to 3.4). In the closing chapter 3.5 I reflect on the research process.

3.1 Project organization

As shown in Figure 4, this dissertation was a **subproject** of the project called *Regionale Wertschöpfung Wald und Holz* (regional value creation forest and wood) led by the Wyss Academy for Nature (Hub Bern) in collaboration with the Bernese industry association of woodworking professionals *Lignum Bern* and the *Amt für Wald und Naturgefahren* of the Canton of Bern. Other subprojects examined subjects such as constructing with regional wood or producing a new product from lower-quality timber (Lignum Bern 2025b). The research for this thesis was not commissioned (and therefore conducted independently) but supported by the steering group of the project *Regionale Wertschöpfung Wald und Holz*: while Prof. Heike Mayer and Prof. Irmi Seidl were responsible for the scientific supervision, the project steering group took the function of an exchange and echo group.

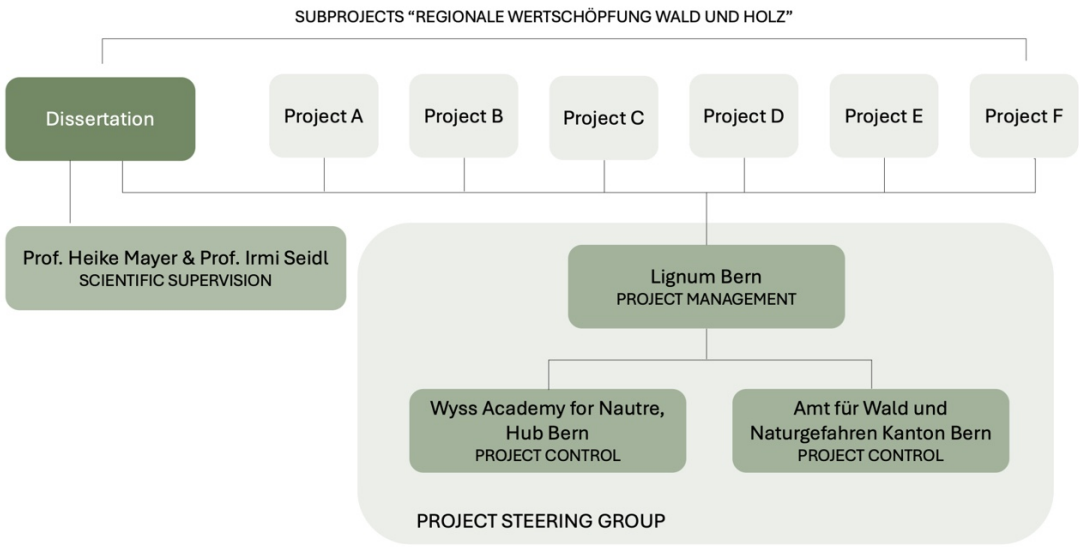

Figure 4: Project organization of this dissertation.

In this setting, **science-practice dialogue** was an integral part of the dissertation. The dialogue comprised regular exchanges on the project status of the dissertation and discussions of preliminary results with the project steering group. In spring 2024, I moreover had the possibility to participate in a

[22] The term worldview is used here to describe a *"basic set of beliefs that guide action"* (Creswell 2009a, p. 6). They may also be called paradigms or epistemologies and ontologies. Worldviews can be seen as a *"general orientation about the world and the nature of research that the researcher holds"* (ibid.).

study trip to Vorarlberg with members of the industry association *Lignum Bern*, where I also presented research insights. Another occasion of science-practice dialogue was the presentation of research findings during a keynote talk for a networking event of the Canton of Bern called *Perspektiven Wald* in autumn 2024. Finally, we (me together with my scientific supervisors) prepared a factsheet that presented results from the first and second research articles for a lay public (cf. Annex 11.4). This factsheet was also sent to interviewees who participated in the research and made available on the project website (https://mountains.unibe.ch). At the time of writing this thesis, two other outlets to present the research findings to a broader public are in the making. These are a second factsheet summarizing the results of the third research article and a reportage on the research of the thesis, which will be published in the magazine uniFOKUS of the University of Bern.

3.2 Worldview

This dissertation adopts a **critical realist perspective** that is useful for studying the relationship between human agency and socially produced structures (Grillitsch & Sotarauta 2025). Critical realism goes back to Roy Bhaskars book 'A Realist Theory of Science' (Bhaskar 2008) first published in 1975. Bhaskar proposes that an objective reality, the 'real' or 'intransitive' world, exists independently from our knowledge, but also recognizes that knowledge is subjective, discursively bound (i.e., transitive) and constantly changing (Vincent & O'Mahoney 2018). In other words, critical realism posits that *"ontology (i.e. what is real, the nature of reality) is not reducible to epistemology (i.e. our knowledge of reality)"* and that *"[h]uman knowledge captures only a small part of a deeper and vaster reality"* (Fletcher 2017, p. 182). Critical realism moreover suggests that reality consists of three domains that are **the real**, **the actual** and **the empirical**. Metaphorically speaking, the empirical is the tip of the iceberg, that is, the events experienced and observed through human interpretation (ibid., p. 183). The actual lies just under the water line and consists of all existing things and events, whether observed or not. The real is the bottom of the iceberg. It contains the mechanisms which cause events at the empirical level to occur (cf. Figure 5). Scientific discovery then consists of developing knowledge about the real world and the mechanisms which generated it (Grillitsch & Sotarauta 2025, p. 111).

A critical realist perspective has several implications for **research on human agency** and guided the way this dissertation approached the relationship between agency and structure. *First,* socially produced structures are on the one hand necessary for human action. On the other hand, human action is necessary for reproducing and transforming socially produced structures (Grillitsch & Sotarauta 2025, p. 115). *Second*, a critical realist perspective implies that structures come with certain causal powers and hold opportunities to act on, meaning that "*human actors transform structures by using causal powers but cannot be seen as 'true' creators"* (ibid., p.112). *Third,* Grillitsch & Sotarauta (2025) also emphasize that structure and agency must be conceived as related but theoretically and analytically distinct categories. From this follows a sequential perspective on structure and agency, meaning that structure predates the actions, which transform it, and that structural configuration postdates those actions (ibid., p.112).

The critical realist perspective also resonates with the **research design** of this dissertation as well as its aspiration to maintain the **dialogue between science and practice**. Using a (comparative) case study as strategy for inquiry and qualitative interviews as the main method is one possible implication of a critical realist perspective (Vincent & O'Mahoney 2018), which is open to diverse research designs and methods (Fletcher 2017, p. 182, Yeung 1997, p. 53). As critical realism is interested in explanation

and casual analysis, it is also *"useful for analyzing social problems and suggesting solutions for social change"* (Fletcher 2017, p. 182). Hence, critical realism (like other worldviews too) supports the formulation of policy recommendations and the suggestion of implications for regional development which are part of this dissertation (cf. chapter 9.3).

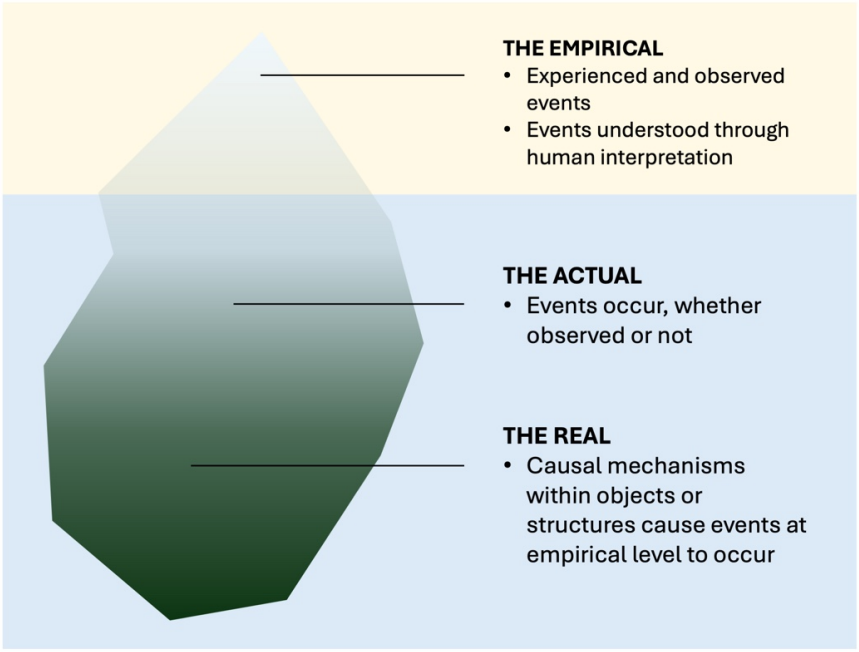

Figure 5: Iceberg metaphor for a critical realism ontology (adapted from Fletcher 2017).

3.3 Qualitative case studies

Researching a phenomenon that is little understood, the dissertation chose a **qualitative approach** (cf. Creswell 2009b, p. 18) which goes along with an **inductive** procedure. For the examination and typification of potentially transformative enterprises (article 2, chapter 6) and the comparison of RIS reconfiguration in the Bern and Vorarlberg timber sectors (article 3, chapter 7), a qualitative **comparative case study approach** was adopted. Qualitative case studies are considered suitable to examine complex phenomena within their context and to explore *how* and *why* they occur (Yin 2018, p. 10). This resonates with the aims of the dissertation, which included illuminating transformative practices in SMEs and understanding how these are embedded in the regional socio-economic institutional and cultural context. A comparative design that juxtaposes similarities and differences between cases seemed fruitful in two ways. *First*, the still new concept of transformative enterprise could be refined through typology building (within-country comparison). *Second*, comparing the transformative trajectories of two regions (between-country comparison) was a way of gaining more insights into the constraining and enabling factors for transformative change (Eisenhardt & Graebner 2007, p. 27).

Selection of case study regions

Case study research for this dissertation was conducted in the **Canton of Bern** (Switzerland) and in the province of **Vorarlberg** (Austria) (for a geographical overview see Figure 8 in chapter 4.2).

Working in the two case study regions resonated with a **transformative attitude** towards **scientific knowledge production**. Because this dissertation was part of the project *Regionale Wertschöpfung Wald und Holz* led by the Wyss Academy for Nature (Hub Bern) (Lignum Bern 2025a), we closely cooperated with actors from the Canton of Bern and the local industry association of woodworking professions *Lignum Bern.* This facilitated access to the field. Working with local research participants also meant that we had the possibility to produce local knowledge that can be given back to the region. At the same time, it opened possibilities for science-practice communication. Hence, the research design incorporated elements of a *transformative science* that seeks to catalyze societal transformation processes (Schneidewind *et al.* 2016).

The selection of the case study regions Bern (CH) and Vorarlberg (AUT) was moreover motivated by the initial observation that the timber sector in the two regions has taken **diverging industrial paths** despite similar geographical and cultural contexts. The wood-processing sector in Bern, Switzerland's most forested Canton (Lüthi *et al.* 2019), faces a fragmented value chain, small-scale ownership and high harvesting costs. Profitability and international competitiveness are thus low (Leitungsgruppe NFP66 2017) and company closures continue (Lüthi 2020a). However, exchanges with industry experts and literature research indicated that in the Bernese timber sector there are also pioneering firms with alternative business goals (Maurer 2017) and companies that implement consistent regionalization and fully renewable products. The Austrian Vorarlberg region shows similar geographical and cultural conditions. With its emerging timber cluster, a nearly complete value chain and high international competitiveness, however, it is better off economically (Gauzin-Müller 2011). Further explanations in chapters 4 and 7 highlight these differences which make the regions interesting for comparison.

Definition and selection of cases

The **definition and selection of cases** is not always straightforward and therefore an aspect worth discussing. In article 2, which examined potentially transformative SMEs in the Bernese timber sector, the cases were empirically defined as SMEs located in the Canton of Bern and active in the timber sector in the year 2021. Moreover, they needed to fulfill (at least some of) the criteria of transformative enterprises we defined earlier (cf. article 1 and chapter 2.5). The cases were selected through theoretical sampling[23] of SMEs, which promised to be unusual and revelatory about transformative practices in SMEs (Yin 2018, p. 50). Practically, this was done by building an inventory of potentially transformative enterprises in the Canton of Bern and applying literature-based ad-hoc criteria for transformative enterprises to this inventory (cf. chapter 3.4 and article 1; Hug et al. 2022, pp. 3–4). In article 3, the cases were defined as the regional innovation systems around the timber sectors in the Canton of Bern and the province of Vorarlberg. The RISs encompass actors, networks and institutions in three subsystems (production, knowledge generation and diffusion, and regional policy subsystem, cf. chapter 2.3). As indicated before, the selection (theoretical sampling) of cases followed the approach of *polar types,* that is, contrasting cases which allow observing contrasting patterns in the data (Eisenhardt & Graebner 2007, p. 27).

[23] In exploratory case study research, theoretical sampling is used as a selection strategy for cases (Eisenhardt & Graebner 2007). Theoretical sampling means that *"cases are selected because they are particularly suitable for illuminating and extending relationships and logic among constructs"* (ibid., p.27).

3.4 Research methods

The research methods used in this dissertation build on each other, and the findings gathered in each part of the research process informed the following part. Part I was based on the method of **literature review** for the characterization and definition of transformative enterprises (article 1). Parts II and III used **qualitative firm and expert interviews** for the examination of potentially transformative enterprises (article 2) and the analysis of the regional innovation system around the timber sector (article 3). Figure 6 presents an overview of used methods and shows how they build on each other. In the following, I briefly describe the methods (more detailed descriptions can be found in the research articles in chapters 5, 6 and 7) and provide critical reflections.

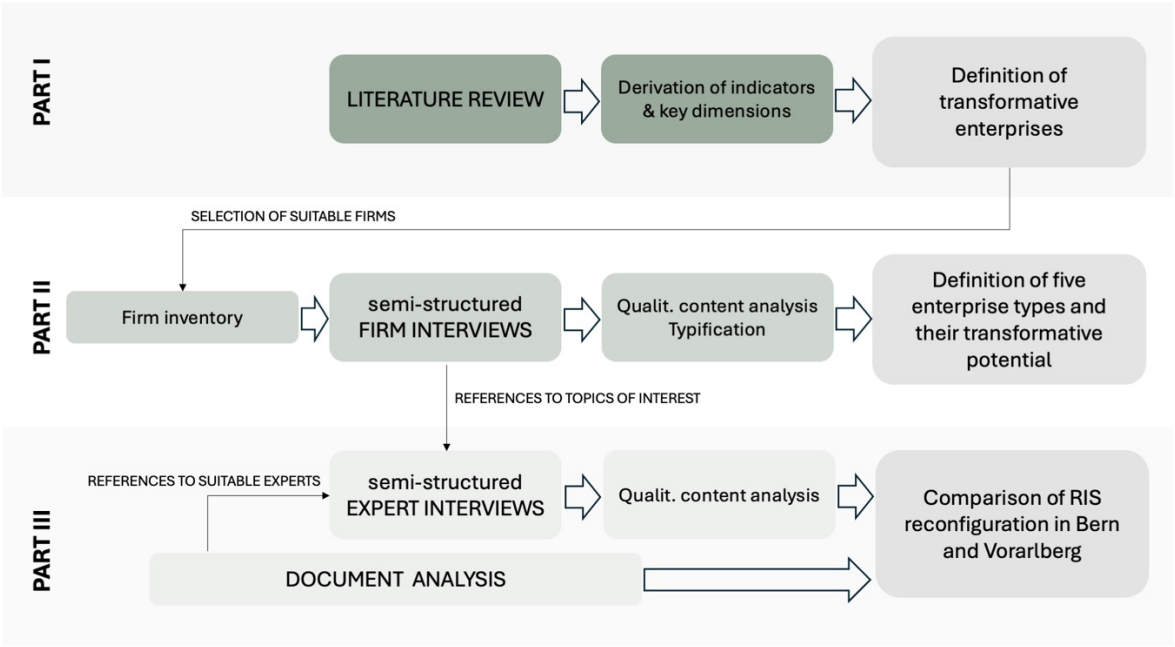

Figure 6: Overview of methods.

Literature-based definition of transformative enterprises

For the definition of transformative enterprises, a **literature review** was conducted to derive indicators for transformative enterprises. The reviewed literature covered enterprises' orientation towards transformation and strong sustainability and was found in the databases Google Scholar, Web of Science and swisscovery. As the literature that specifically speaks of *transformative enterprises* is small and only includes German-language publications, it was decided to use related search terms that were *enterprise, entrepreneurship, growth, degrowth, post-growth, growth-independent, transition, transformation, sufficiency, sustainability* and *sustainable*. The search terms were applied in English and German and publications in the two languages chosen. Selected publications moreover had to be published and written between 2010 and 2021.

After a first selection of publications, we decided to only use papers which explicitly discussed characteristics of transformative enterprises. The latter should moreover be operationalizable as binary (Y/N) indicators. Publications which fulfilled these criteria were fully read and text statements about transformative enterprises were translated into indicators. Reading through suitable publications

moreover led the way to other ones (snowballing). From this iterative process resulted a final selection of 44 publications, from which 30 indicators for the description of transformative enterprises were derived. Indicators were subsequently grouped thematically around nine key dimensions (for the description of key dimensions and indicators see chapter 2.5 and chapter 5). A detailed list of indicators, including their description, possible implications, related indicators and references can be found in Annex 11.1.

Although this procedure of defining transformative enterprises used defined search terms, it can only be called semi-systematic: a fully systematic literature review does not include snowball sampling, and the inclusion and exclusion criteria need to be explicit at the beginning of the study. Moreover, systematic literature reviews are ideally documented in a research protocol, which ensures reproducibility (UTHealth School of Public Health 2024). Nevertheless, it seemed that theoretical saturation was reached with the selection of 44 publications. Including more literature would not have led to novel insights. More recent contributions which describe enterprises aiming at strong sustainability (e.g., Bruckner 2024) neither describe characteristics that are not yet included in the definition of transformative enterprises.

Qualitative interviews

The principal method in the second and third parts of the dissertation were qualitative semi-structured interviews[24]. **Semi-structured interviews** follow an interview guide but let the interviewees freely articulate their thoughts and experiences. Also, the person leading the interview may request more information on specific topics or add further questions that seem relevant during the conversation (Flick *et al.* 1995, p. 177). In economic geography, semi-structured interviews with firms (**firm interviews**) have been increasingly used since the 1990s for researching firms in their historical and institutional embeddedness (Schoenberger 1991). **Expert interviews** are another variant of the semi-structured interview and are applied if the interviewees expertise in a specific field of application is of interest (Flick 2017, p. 214).

Firm interviews in part II

Part II of the dissertation used **semi-structured firm interviews** to examine potentially transformative enterprises in the Bernese timber sector. Because a list of possibly transformative enterprises was inexistant, a **firm inventory** was built to pre-select suitable firms for interviews. Firms in the inventory should correspond as much as possible with the definition of transformative enterprises elaborated in part I of the dissertation. Four interviews with industry experts gave initial information on pioneering and well-known firms. By using the snowballing principle and additional desktop research, lists of professional associations, and statistical information, data on 86 SMEs in the Bernese timber sector was then collected. Inventory data covered 14 categories: products and services, legal form, founding year, firm history, family enterprise, number of employees, vision or mission statement, sustainability, sustainability report, labels and certificates, circular economy, membership in

[24] All interviews for this thesis were held in Swiss German or High German and then transcribed and coded in High German. All interview quotes provided are my own translations.

professional associations, awards, and coverage in the media. After applying ad-hoc selection criteria[25] from the literature on transformative enterprises to the inventory data, SMEs were contacted with interview requests.

24 SMEs (in all but one cases the owner or co-owner) agreed to give an interview. Interviews were held between **March and September 2021**. The interview guide foresaw questions on the nine key dimensions of transformative enterprises (because the definition was not finalized at the time of the interviews, key dimensions were queried in a slightly different order), asked about challenges the enterprises encounter and addressed the enterprises' scope of action for introducing changes (cf. interview guide in Annex 11.2). All interviews were recorded and then transcribed and coded with the software MAXQDA. Coding followed **qualitative content analysis** (Mayring & Fenzl 2019) with deductive and inductive phases (assigning text to nine key dimensions of transformative enterprises and building new categories that emerged from the transcript).

Conducting firm interviews was an appropriate method for an exploratory study like the examination of potentially transformative enterprises. But this method also has its limitations: even though 24 firm interviews seemed to be enough to capture the spectrum of potentially transformative enterprises in the Bernese timber sector, a more quantitative approach may have delivered additional information. Specifically, a standardized firm survey with questions on all nine dimensions of transformative enterprises could have complemented the qualitative interviews. I see potentials in such a mixed methods approach for two reasons: on the one hand, in a standardized survey, the person leading the investigation is less prone to directly influence the results (even though questions must be formulated with caution). This means that the problem of reflexivity is reduced, i.e. that the perspective of the person leading the interview unknowingly influences the interviewee's responses, but those responses also unknowingly influence the line of inquiry (Yin 2018, p. 120). On the other hand, surveys generate data that allows (quantitative) generalizations, which may be different from generalization obtained by typification, and are certainly of interest for a general public that appreciates numbers and percent values.

Expert interviews in part III

The dissertations' **third part** drew on **semi-structured expert interviews** for the comparison of RIS reconfiguration in Bern and Vorarlberg. Before and during the interview phase, a **document analysis** which covered industry reports, statistical data, policy documents, newspaper articles, books and scientific articles was conducted. Findings from this analysis on the one hand complemented insights gained during the interviews and on the other informed me about potential interview partners. Personal contacts were an additional source for finding suitable experts to be interviewed. A total of **24 persons** agreed to give an interview, 11 of which in the province of Vorarlberg and 13 in Bern. In **spring 2024**, 11 interviews were conducted on site and 12 online. Questions on the development of the regional

[25] Selection criteria had to be applicable to the information in the inventory. The criteria were: (1) firm was mentioned by more than one expert, (2) SME is a pioneer / SME with radiance (award winner etc.), (3) the SME uses regionalization strategies (use of Swiss wood, emphasizes economic embeddedness in the region), (4) the firm is committed to the future development of the industry (own or joint projects etc.), (5) the firm is explicitly growth critical, (6) the SME shows (explicit) social commitment (work integration, employment of refugees etc.), (7) the firm has the label 'Holzbau Plus' (honors good practices and employee wellbeing in carpentries).

timber sector, sustainability-related challenges, key RIS actors and the way in which they have been influencing RIS dynamics, and the entrepreneurial environment in relation to socio-economic transformation were part of the interview guide (cf. Annex 11.3). Other topics of interest, for example the difference between the Swiss and the Austrian timber sector, which was repeatedly mentioned by interviewees in part II, were also taken up during conversations. Interviews were again recorded and then transcribed and coded in MAXQDA.

Data analysis drew on **qualitative content analysis** (Mayring & Fenzl 2019) and **typification** (Kuckartz 2010, Kluge 2000)**.** In a first step of deductive coding, text was assigned to pre-defined categories that were based on the research questions (e.g., RIS actors and change agents, framework conditions supporting or hindering change). Second, inductive coding served to build new categories that emerged from the transcript, for example on the organization of the sector or other background and insider information. Finally, typification was used to describe different types of potentially transformative enterprises among the interviewed SMEs.

Expert interviews with an accompanying document analysis provided a solid foundation for the comparison of RIS reconfiguration in a comparative case study setting: this method identified key actors, networks and institutions in the RIS and gave insights into the historical developments of the timber sector. However, I also see some unrealized potentials here: the logic of comparing and contrasting we used in the case study could have been complemented with a logic of tracing cases across sites and scales as proposed by Bartlet & Vavrus (2017b) in their comparative case study approach (CSS). The three axes of comparison the CSS uses may have provided additional insights through comparison across SMEs (horizontal comparison), across scales (vertical comparison) and over time (chronological comparison) (Bartlett & Vavrus 2017a, p. 14). Particularly the comparison at the micro-level, i.e., across SMEs in Switzerland and Austria, seems interesting and would have presented a nice reference back the first and second part of dissertation. Finally, applying the CSS may not only have generated additional insights, but could also open new methodological avenues for research in evolutionary economic geography, as it resonates with calls to incorporate processual approaches in EEG (Pike *et al.* 2016).

3.5 Reflections on the research process

Scientific knowledge production is always partial and situated (Müller 2013). Therefore, I try to create transparency by reflecting on the research process and my positionality as a researcher. As regards the **research process**, there were surprisingly little unforeseen events, and no major changes of the initial research plan were necessary. Not even the restrictions due to Covid-19 posed problems for holding interviews on site. And for field work in Austria, I planned a trip with the whole family which had grown in the meantime. However, like with any research project, time is always too short to put all plans into practice. Hence the research project holds some unrealized potentials which I discussed above. Perhaps the most challenging moments of this research project emerged during moments of **science-practice dialogue**. The latter is gaining importance in times of increasing skepticism against academic work and was an integral part of this dissertation. Through the collaboration with the Wyss Academy for Nature, the research project was well-situated for this dialogue. As mentioned before, I had several opportunities to present the research findings to practitioners and summarized research results in a fact sheet for the lay public (cf. Annex 11.4). Even though practitioners were generally curious and

sympathetic with my research, I sometimes had to emphasize the benefit of a qualitative study. Besides that, I faced the challenge of simplifying – but not oversimplifying – complex research findings to make them accessible.

To conclude, I want to mention my **positionality** as a researcher – the fact that my social and cultural position affect the whole research process from the questions asked to the interpretation of data and dissemination of findings (Pratt 2009) – which also influenced the research process. My interest in sustainability transformation has always been high. Reading the book *Prosperity without Growth* by Tim Jackson (2017) was a particularly enlightening for me and spurred my interest in post-growth. Initially, I did not plan to research the timber sector. But when the possibility opened to work on the topic in collaboration with the *Wyss Academy for Nature* and the Canton of Bern, I quickly accepted. On the one hand, I saw the potential of science-practice dialogue in this collaboration. On the other hand, my inclination to work on the timber sector was high because I had spent months of vacation in my family's century-old wooden house and helped to renovate the roof with wooden shingles.

The effects of positionality are also visible in the relation with research participants. For example, I had some concerns that being an introvert, studied, Swiss-German speaking woman in her 30s could complicate access to the field. However, the willingness of interviewees to participate in the study was surprisingly high and many appreciated my attention. In some instances, though, I felt skepticism against *the studied people doing desktop jobs who tell us what to do*. Here, more practical knowledge and insights into daily work routines of craftsmen and -women would have been helpful to enhance mutual understanding. I therefore would have liked to follow the invitation of one of my interviewees and start as an intern in their company. However, time restrictions and care duties I had as a mother of a toddler prevented me from doing so.

4 Empirical context: the timber sector

This chapter provides background information on the empirical context of this dissertation, the timber sector. The **timber sector** is attributed a **pivotal role in sustainability transformations** through decarbonization and climate change mitigation (e.g., European Commission 2018, Taverna *et al.* 2007). At the same time, the forestry[26] and timber sector is usually not known for being very innovative or transformative (Nilsen *et al.* 2024). For many people, the industry has the reputation of being characterized by hard, dangerous work, masculine values and a lack of innovativeness due to 'ancient' production processes (ibid., p.2). Particularly in Switzerland, where the sector has not seen large-scale industrialization after WWII, it was for a long time associated with an old-fashioned and dusty image. Together with the fact that wood is among Switzerland's and Austria's important renewable resources (e.g., Pauli-Krafft *et al.* 2021), this starting point makes the timber sector interesting for a study on sustainability transformation. After a general description of current trends and challenges in chapter 4.1, I depict the Bernese and Vorarlberg timber sectors and show why they are two interesting cases for comparison (chapter 4.2).

4.1 Current trends and challenges

At present, the forestry and timber sector is facing **profound transformations**, which are embedded in larger ecological and societal transformations (e.g. climate change, sustainability transformation, political and societal changes) (Heinimann & Teischinger 2024, p. 325). Current **trends** in the timber sector, which go along with certain **challenges,** are signs of those transformations. But before explaining the trends and challenges in more detail, it seems helpful to briefly describe the **wood value chain,** which constitutes the sector.

As depicted in Figure 7, the **wood value chain** starts with timber harvest (primary production). The products resulting from harvesting are logs, waste wood, energy wood from forests and industrial wood. After harvesting, most wood is transferred to the first processing stage: the sawing industry produces sawn timber, construction timber, solid wood boards and cross-laminated timber and laminated timber. Industrial wood of lower quality ends up in the engineered wood industry, which produces wood-based materials by shredding wood and then joining the structural elements together (e.g. particle boards, plywood and wood fiberboards). Other parts of industrial wood are used for wood pulp production. The latter is used in the paper industry. In the second processing stage, the already processed wood is transformed into end products. The building industry for example produces doors, stairs or windows, some wood is used for interior construction like furniture or floors, other parts end up in woodware manufacturing and packaging, and printers and publishers use the paper made of wood. Because it relies on a decentralized available resource, the wood value chain has long contributed to (rather small-scale) regional value creation in many regions. However, many persons interviewed for this dissertation lamented that those regional value chains are today increasingly disintegrated because

[26] The empirical parts of this dissertation (parts II and III) did not investigate forestry (i.e., primary production) in depth. The paper industry was also not considered in the empirical investigation because this part of the value chain is missing in the Canton of Bern (cf. Figure 7). Because the forestry and timber sector are part of the same value chain and heavily dependent on each other I discuss both in this chapter.

of the globalized timber market and accompanying concentration dynamics (cf. Pauli-Krafft *et al.* 2021, p. 19, Lüthi 2021, p. 10). With growing pressures to digitize production and move towards an 'industry 4.0' in the timber sector[27], it is likely that these dynamics continue because small enterprises often lack the resources for heavy investments (Heinimann & Teischinger 2024, p. 300ff., Pauli-Krafft et al. 2021, p. 36).

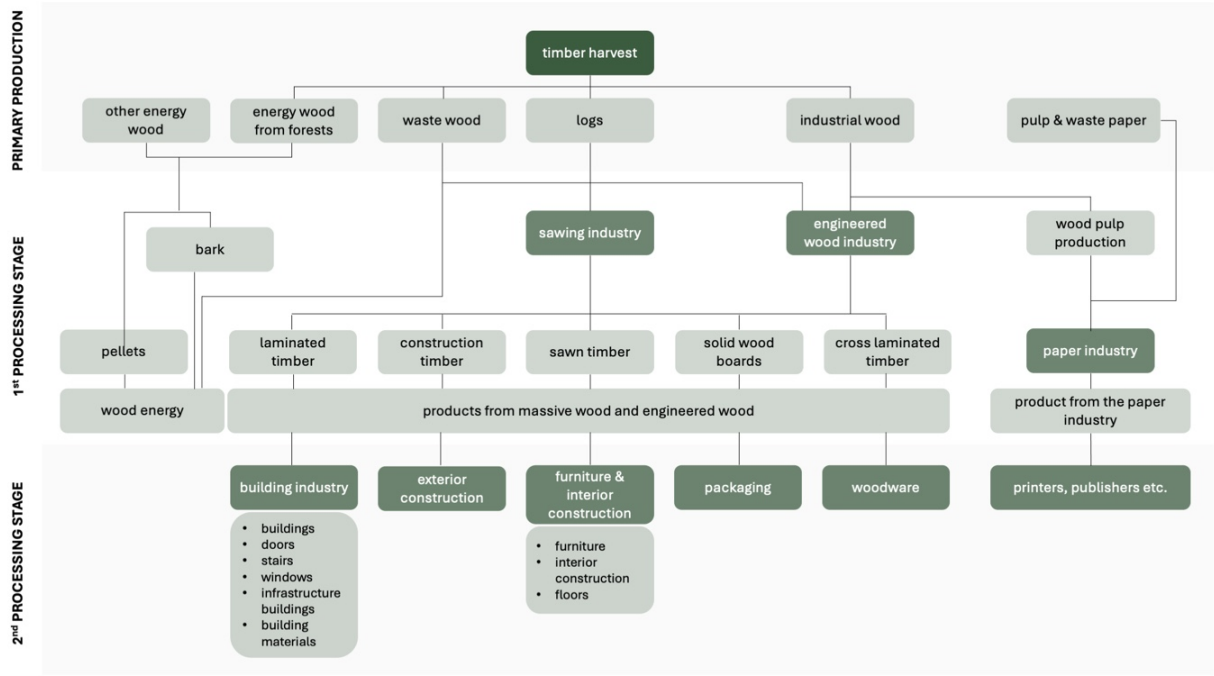

Figure 7: Schema of the wood value chain (adapted from Lehner et al. 2014).

In their recent analysis of transformation in the Central European forestry and timber sector, Heinimann & Teischinger (2024) identify three **major trends** and associated **challenges**. A *first* trend concerns **forestry** (primary production), which today is acting in a conflict-laden field of tension. This field of tension is characterized by requests to provide more biological capacity for CO_2 sequestration and storage (e.g. reforestation), additional demand for wood for material and energy use (it is estimated that the demand will increase by 50 to 100% by 2050), global biodiversity goals demanding protected areas and reserves (UNEP 2022) and higher risks due to changing environmental conditions (increase of calamities such as fires, storms etc.) (Heinimann & Teischinger 2024, p. 327). A *second* trend is that the use of the forest is today associated with many **insecurities** because of changing framework conditions: forests are a common good and the demands on the forest have increased. Resource use in forests sometimes conflicts with leisure uses or claims to install reserves. The general population is therefore often critical about wood harvesting. Moreover, non-state actors (e.g. the FSC[28]) implement

[27] As regards digital transformation, the forestry and timber sector counts as rather backwards (Heinimann & Teischinger 2024, p. 308). With the efforts to implement a bioeconomy and advances in modern timber construction (e.g. building information modelling BIM), digitalization will become more important in the future. Because the topic was seldomly mentioned during interviews, I will not expand on it further here.

[28] The Forest Stewardship Council (FSC) exists since the mid 1990s and provides a quasi-legal instrument to guarantee forestry that conserves biological diversity, generates use for the local population and workers and secures economic viability. Ten principles, which are adapted to each country, circumscribe the requirements for

their rules in addition to the state. Insecurities regarding forest use can lead to underutilization and neglect of forest maintenance (ibid, p.326f.).

A *third* trend regards the **bioeconomy**[29]. Today, the European Union (cf. Fritsche *et al.* 2020) and many European countries, including Austria (cf. Albert *et al.* 2019), have bioeconomy strategies[30] (the bioeconomy is also a topic in Switzerland, but the country does not have a separate strategy[31] (Pauli-Krafft *et al.* 2021, p. 42)). Bioeconomy strategies aim at replacing CO_2-intense construction materials (cement, steel) and petroleum-based substances and materials (plastics, bitumen etc.) with biobased materials. Being based on a renewable resource, the timber sector is ascribed a key role in a future bioeconomy (Studer & Poldervaart 2017, European Commission 2018) and has great potential to contribute through the substitution of petroleum-based substances and CO_2-intense materials and CO_2-sequestration in long-lasting infrastructure facilities. More concretely, this would imply consequent cascadic[32] or even circular[33] use of the resource wood, the use of side products from the sawing and paper industries (e.g. for wood-based cellulose fibers for the production of textiles) and the development of new products from hardwood (e.g. for producing bio-plastics, cosmetics etc.) (Hassel *et al.* 2024, p. 26, Heinimann & Teischinger 2024, pp. 284–286). The way there is, however, long: today, about 40% of the wood harvest in Europe is directly used for energy production (which means that CO_2 is released to the atmosphere) and cascadic or circular use of the resource wood is far from realization (Heinimann & Teischinger 2024, p. 328).

Bioeconomy strategies also address **timber construction**, which may promote climate change mitigation (wood stores roughly 1t of CO_2 in $1m^3$) by replacing CO_2-intense construction materials like

responsible, sustainable forestry. Those principles fall into the category of "soft law", i.e. non-binding and not enforceable procedures from a rule of law perspective (Heinimann & Teischinger 2024, p. 9).

[29] The EU defines bioeconomy as the production of renewable biological resources and the conversion of these resources and waste streams into higher-order products such as food, biobased products, and bioenergy (Pauli-Krafft *et al.* 2021, p. 47, see also European Commission 2018).

[30] The concept of a bioeconomy is sometimes criticized for being nothing more than another greenwashing strategy, i.e. a superficially sustainable image for an unchanged form of economic activity. Others stress that the concept of a bioeconomy has the potential to introduce real paradigmatic changes, which would contribute to keeping economic activity within planetary boundaries (Hassel et al. 2024, p. IXf.). At the moment, however, the prevalent visions of a bioeconomy are optimistic vis à vis economic growth and technological innovations while the idea of strong sustainability is not considered (ibid., pp.194-197). From the perspective on sustainability transformations adopted in this dissertation, the concept of bioeconomy therefore must be viewed critically.

[31] In Switzerland, bioeconomy concerns are addressed in various political strategies tackling sustainable development and the reduction of oil dependency. In 2017, the national research program on the resource wood (Nationales Forschungsprogramm NFP66 Ressource Holz) proposed to implement a strategy for the wood-based bioeconomy that would include consistent cascade use of the resource, e.g. through extending existing plants, and high domestic value added with wood (Studer & Poldervaart 2017, p. 46f.). Up to date there is no such strategy.

[32] In the context of the forest and timber sector, cascade use means the processing of the entire biomass of trees in graduated disintegration steps. In a typical wood cascade, the biomass is first used as a material (e.g. solid wood furniture), then recycled (e.g. chipboard made from waste wood) and finally burned to generate electricity and heat. In between, further processing steps are possible (e.g., particle materials, fibre-based materials or the mostly chemical utilization of residual wood assortments in the fibre materials industry) (Hassel et al. 2024, p. 229).

[33] Circular use means that the resource is used in several cycles before it is fully burned. In the case of wood, circular use is (theoretically) possible for some solid wood parts. However, a largely closed-loop approach to material use is only possible to a limited extent for the resource wood because the latter always undergoes a certain amount of degradation during recycling (Heinimann & Teischinger 2024, p. 286).

cement and steel. Lowering the climate impact of the construction sector is key because the latter counts as the most CO_2-intense industry (Affolderbach & Schulz 2024, p. 337). Whereas other realms of the bioeconomy are still in their infancy, modern timber construction has indeed been **booming** lately. Thanks to recent advancements in timber construction technology, the scope of building projects which can be realized in wood has increased tremendously. Today, even high-rise buildings, large infrastructural buildings and bridges are built (mainly) in wood (Hildebrandt *et al.* 2017). In the future, the main challenge will be to replace unsustainable processing and modification techniques like the use of fossil-based precursors (e.g. glue) with sustainable ones. Buildings and infrastructure must be constructed in a way that makes their decomposition and re-use possible (Goldhahn *et al.* 2021).

4.2 The timber sector in Bern (CH) and Vorarlberg (AUT)

The empirical investigations of this dissertation focused on the timber sector in the **Canton of Bern**, Switzerland, and in the Austrian province of **Vorarlberg** (cf. Figure 8). The two regions share social and cultural commonalities, but at the same time their timber sector differs in terms of structure and performance. In the following, I briefly discuss those commonalities and differences, which make the two cases interesting for comparison (for more details, including a table comparing the regions, see the third research article in chapter 7).

Figure 8: The two case study regions (map: Noah Suter & Jonathan Lanz).

A glance at the **natural landscape** and the **socio-economic conditions** of the Canton of Bern and the province of Vorarlberg reveals many commonalities. The Canton of Bern is 2.3 times larger than Vorarlberg and its population exceeds the one of Vorarlberg by roughly 2.5 times (Finanzverwaltung Kanton Bern 2023, Rücker *et al.* 2018, Knecht 2023). But apart from their differing size, both regions' natural landscape is comparable, with a lowland accommodating larger cities and agglomerations and a mountainous zone. Forests, which cover slightly more than 30% of the total surface in both regions,

dominate these mountainous zones and frequently have a protective function[34] (Finanzverwaltung Kanton Bern 2023, Forstwesen Vorarlberg 2021, Lüthi 2021). While strict forest laws ensure that harvest remains below natural reproduction and contribute to the good state of forests, over-aging, browsing by game, pest infestations and other calamities related to climate change (fires, storms etc.) are major concerns in Bern and Vorarlberg (Forstwesen Vorarlberg 2021, Bundesamt für Umwelt BAFU 2001). As regards the socio-economic conditions, both regions are part of the German-speaking area and have similar purchasing powers[35]. Compared to national numbers, Bern is economically weaker than other Cantons (statista 2023), whereas Vorarlberg is amongst the wealthiest Austrian provinces (statista 2024a). Bern and Vorarlberg are both part of a federal state and have high autonomy. However, Bern, the capital and seat of the national parliament, is the political center of Switzerland. In contrast, Vorarlberg is the westernmost province of Austria far from Vienna and can be described as politically peripheral (Grabher 2018).

Concerning the structure and performance of the **timber sector,** differences between the two regions are more pronounced. The Bernese timber sector is dominated by SMEs, most of them micro-enterprises with one to nine employees (Lüthi 2021, p. 16). In Vorarlberg too, most firms of the timber sector are SMEs, but there are also a few large firms with more than 250 employees. Differences between Bern and Vorarlberg continue with the amount of raw timber exported for processing (within-country and abroad): the share is higher in Bern (48%) (calculation based on Lüthi 2021, p. 18) than in Vorarlberg (22%) (calculation based on Drexel 2023, p. 14). This implies that in Bern value added is less captured in the region (Lüthi 2021, p. 18). One reason for this is that Swiss sawmills remained small, little technologized and geared towards the domestic market (Lehner *et al.* 2003, pp. 7–8), while neighboring countries, including Austria, saw major investments in the sawing industry after WWII. Vorarlberg has more sawing capacity than Bern as there are large, industrialized sawmills. Sawn timber is among the main exports of the Vorarlberg wood value chain (Regionalentwicklung Vorarlberg eGen & Telesis GmbH 2018, p. 6). Although Vorarlberg also depends on imports of higher-quality products like construction timber, efforts to strengthen the regional value chain have been more successful in the province than in Bern. This is also due to the regional timber cluster called *Vorarlberger Holzbaukunst,* which facilitates networks among enterprises that foster synergies at a regional scale and strengthen the supply chain (for a discussion of other key institutions in the Vorarlberg and Bern timber sectors cf. chapter 7 on pp. 87-92) (Caneparo & Dallere 2024, p. 40).

Vorarlberg and Bern alike are confronted with the broader trends and challenges described earlier. At the regional level, these **challenges** express themselves in three realms. *First*, in the wake of bioeconomy efforts, the sector is challenged to make products – furniture, components, entire houses – reusable in the sense of a **circular economy**. New products and building systems need to be developed because today composites like plastic and glue but also metallic parts like screws or cement compromise reusability (Goldhahn *et al.* 2021, S-WIN 2021). However, circular or at least cascadic uses of the

[34] In mountain areas, forests oftentimes protect buildings and infrastructure from rockfalls, debris flows, floods or avalanches. The management of protective forests is therefore subsidized and an important task of forestry in those areas. Under the changing climate, the tree composition of protective forests needs to be adapted (e.g., more heat-resistant species) (Kanton Bern 2025, Land Vorarlberg 2025a).

[35] In 2022, GDP per capita was EUR 84,855 (CHF 81,199) in Bern and EUR 56,800 in Vorarlberg (statista 2023, statista 2024b). The comparative price level is: 100 (Austria), 159 (Switzerland), which amounts to similar purchasing powers (OECD 2024).

resource wood are unprofitable: prices for combustible wood are high and wood recycling is expensive. *Second*, the Bern and Vorarlberg timber sectors struggle to keep **economic competitiveness** and to maintain **regional value chains**. Under the circumstances of globalized markets, cost and growth pressures have increased (Bundesamt für Umwelt BAFU 2018, p. 81, Pauli-Krafft *et al.* 2021, p. 19). Forestry and small SMEs in the sawing industry are particularly concerned. Wood harvesting nowadays yields little money (Bürgi *et al.* 2022) and competition with large players is pronounced in the sawing industry. The globalized timber market is also one cause for the disintegration of regional value chains: because sourcing wood regionally is often more expensive, transport distances increase. Gaps in the value chain, like the lack of a producer of laminated wood in Vorarlberg and Bern, or the missing paper industry in Bern, intensify the challenge to capture value added in the region. *Finally,* **cooperation** among all actors of the value chain and **communication** and **marketing** activities gain importance in times of "green" or "recycled" cement, which is promoted by a strong lobby and a population that is increasingly critical about wood harvesting (Amt für Wald (KAWA) 2018, S-WIN 2020). The described challenges are the same in both regions, although the second and third is more pronounced in the Bernese timber sector.

Despite these challenges, the timber sector plays an important role for **regional economies** and **sustainable regional development**. Even though the economic contribution of the timber sector seems small in numbers (5% of the national gross value added in Switzerland vs. 8% in Austria (Heinimann & Teischinger 2024, p. 175)), it provides valuable jobs in the mountainous parts of Bern and Vorarlberg. In the Canton of Bern, several projects of the timber sector, such as an innovation and cooperation platform or wood heating plants (cf. regiosuisse 2025b), have been supported by the national policy instrument for regional development called New Regional Policy (*Neue Regionalpolitik, NRP*), which aims at reducing regional disparities and maintaining decentralized settlement. However, the resource wood only plays a minor role in regional development policy in Bern. This contrasts with Vorarlberg. Since the formation of the *Association of the Vorarlberger Baukünstler*, a group of young architects who promoted ecological, community-oriented and at the same time modern timber construction in the 1960s (cf. Grabher 2018), Vorarlberg is internationally renowned for modern timber architecture. Policy makers have capitalized on this asset. Today, building culture and regional value creation are supported by several policy instruments and institutions (e.g., the *Ökologischer Gebäudeausweis*, which ties subsidies for construction to ecological and social criteria, and building advisory boards in communities) and are attributed a central role in regional development and the revitalization of rural communities (Gauzin-Müller 2011, pp. 271, 337–343, Gauzin-Müller 2020).

To conclude, the timber sector is interesting for studying transformative enterprises and sustainable regional development because it is confronted with serious challenges but at the same time some industry features may also be favorable for transformative enterprises. Being based on the renewable resource wood, the prerequisites for ecological sustainability are good in the sector. Moreover, the industry structure with mostly small and family-owned SMEs that are rooted in their regions can favor social engagement and cohesion within enterprises and beyond. The timber sector is moreover interesting for the study of sustainable regional development because it is important for regional economies in mountain regions and can contribute to a lived building culture. Bern and Vorarlberg are two regions with social and cultural commonalities but decisive differences in their timber sector, which makes them interesting for comparison.

II. ARTICLES

5 Transformative enterprises: characteristics and a definition

Article 1

Full title: Transformative enterprises: characteristics and a definition

Authors: Miriam Hug, Heike Mayer, Irmi Seidl

Journal: Geography Compass

Status: Published

Received: 28 February 2022 | Revised: 22 August 2022 | Accepted: 10 October 2022

DOI: 10.1111/gec3.12667

REVIEW ARTICLE

WILEY

Transformative enterprises: Characteristics and a definition

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Funding information
Wyss Academy for Nature at the University of Bern, Grant/Award Number: AWN-2

Abstract

This paper contributes to an emerging discussion about transformative enterprises, which are increasingly seen as change agents in sustainability transformations. Some scholars have hitherto described them as pioneering enterprises that strive for fundamental changes towards sustainability at different scales. Economic geography has, however, so far glossed over a micro-perspective on such enterprises. In this paper, we define transformative enterprises in detail by systematically identifying and elaborating their characteristics and actions. We ask: *What operationalizable characteristics that refer to transformative enterprises are discussed in the literature? How* can *we define transformative enterprises?* Starting from a comprehensive literature review, we identify nine key dimensions of transformative enterprises that we specify with a set of indicators, and we then synthesize our finding with a definition. With this contribution, we further develop the concept of transformative enterprise in economic geography and show how it complements current conceptualizations of firm-level agency and system-level agency.

KEYWORDS
change agent, definition, economic geography, indicators, key dimensions, sustainability transformation, transformative enterprise

1 | INTRODUCTION

Although often perceived as unspectacular and overlooked, small and medium-sized enterprises (SMEs) may initiate industry changes needed in times of grand challenges like climate change, biodiversity loss and recurring economic crises (cf. Coenen et al., 2015). There are indeed examples of SMEs that employ regionalization strategies, develop renewable products or promote sufficiency, thereby forging new paths and turning into *change agents*[1] (North, 2016). Some German-language scholars of corporate social and environmental responsibility refer to such firms as transformative enterprises ("transformative Unternehmen", Pfriem, 2021; Scholl & Mewes, 2015a)[2] which are described as pioneers who strive for fundamental changes towards sustainability. But what exactly are the characteristics of such SMEs? In what ways are they different from "normal" SMEs, and how do they bring about changes towards sustainability?

Even though economic geographers started addressing sustainability matters, their understanding of development mainly rests on the premise of economic growth (e.g. Donald & Gray, 2019) and they predominantly draw on the concept of the "green economy", which embraces decoupling material throughput from economic output by technological advances (Schulz & Bailey, 2014). But critical voices about the feasibility of absolute decoupling become louder (e.g. Haberl et al., 2020), and some scholars start seeing the need to think development beyond a single focus on growth (Martin, 2021). One discourse that takes up this critique is that on a Great Transformation.[3] The German Advisory Council on Global Change WBGU took up the term in the context of sustainability transformations to propagate profound changes that include, restructuring national economies and the global economy, so as to stay within planetary boundaries and to prevent irreversible damages of earth systems and ecosystems (WBGU, 2011a, p. 417). This transformation goes beyond "greening" industries and decoupling. It involves systemic ecological, technological, economic, institutional, and cultural changes towards modes of living, working and economic activity that do not exceed the ecological basis of the planet (Schneidewind, 2019, p. 11). The need to keep economic activities within planetary boundaries makes it necessary to imagine alternatives to growth-based economies as sufficient decoupling seems unlikely. At the industry level, this means changing technologies, implementing new social and environmental standards, and ending the use of fossil fuels. At the enterprise level, major changes in input, output, production processes and practices, and stakeholder relations are necessary. In our understanding, this implies a notion of strong sustainability.[4] Together with geographers engaging with transformative geographies (Schmid, 2019, e.g. Grenzdörffer, 2021), we think that this transformation discourse[5] can help us broaden our understanding of economic development.

Economic geography research interested in SMEs as critical actors in a regional economy has only recently turned towards sustainability matters (Tödtling et al., 2021; Trippl et al., 2020, p. 189), and little is known about the characteristics of enterprises that shape sustainability transformations. In evolutionary economic geography (EEG), for example, the notion of green path development is used to describe the rise of new green industries or the "greening" of existing ones (Trippl et al., 2020, p. 189). But while path development is mostly depicted as a firm-driven process (Baumgartinger-Seiringer et al., 2020, p. 2), EEG has been criticized for its focus on aggregated firms (Kyllingstad, 2020, p. 1): A micro-perspective on these firms[6]—an account of their visions, governance structures, the products and services they sell—is still missing (e.g. Hassink et al., 2019; Jolly et al., 2020). Other economic geography conceptions of firms do not help here either because they remain at a meta-level and lack precision (Taylor & Asheim, 2001). This means that although the idea to study regions by studying firms was promoted a long time ago (Markusen, 1994), there is still a dearth of knowledge on "*…how economic and other actors create, recreate, and alter paths*" (Martin, 2014, p. 619).

Closer attention to agency has therefore been identified as key for understanding regional path development (Steen, 2016). One recent conceptualization of agency is that of firm-level agency and system-level agency (Isaksen et al., 2018). Firm-level agency, defined as *"actors who found new firms or introduce innovative activities within existing companies"* (Trippl et al., 2020, p. 193f.), has its main influence within the firm or organization (Hassink et al., 2019, p. 1638). System-level agency in contrast are actors who transform innovation systems and exert influence outside institutional or organizational borders (ibid.). Both types of agency are needed for new path development to unfold (Trippl et al., 2020, p. 193f.), and hence also for transformation towards sustainability. The bigger the changes, however, the more important system-level agency becomes (Isaksen et al., 2018, p. 8). Firm-level agency

and system-level agency are also referred to in studies on regional restructuring and transformation of regional innovation systems (RIS) (Isaksen et al., 2018). More recent conceptualizations of RIS like challenge-oriented RIS (CoRIS) (Tödtling et al., 2021) that foreground sustainability concerns and grand societal challenges, in particular, insist on the need of powerful system-level actors (ibid, p. 8). The more radical the reconfiguration of a RIS, the greater the need for new innovative actors and actor groups who implement institutional changes (Isaksen et al., 2022).

With their ability to exert firm-level and system-level agency, enterprises can play a key role in a transformation towards sustainability (Schneidewind et al., 2012). As so-called transformative enterprises, they can go beyond using green technologies and advocate for regionalized economic cycles, sufficiency, alternative ownership etc. But the knowledge on the characteristics and agency of transformative enterprises is scarce. We found that most scholarly contributions addressing the characteristics of enterprises aiming at strong sustainability are from the field of post-growth,[7] whose advocates understand transformation as profound change towards economic stability and human well-being within planetary boundaries, and towards a socio-economic organization without the necessity of economic growth (Asara et al., 2015; D'Alisa et al., 2015; Jackson, 2017; Schmelzer & Vetter, 2019; Seidl & Zahrnt, 2010). But apart from one comprehensive literature review on enterprises approaching degrowth (Hankammer et al., 2021), knowledge on transformative enterprises is fragmented. Many different labels for such enterprises like "growth-neutral enterprise" (Deimling, 2016; Liesen et al., 2013), "post-growth business" (Hinton, 2021), "degrowth company" (Khmara & Kronenberg, 2018), "common-good-oriented company" (Wiefek & Heinitz, 2018) or "transformative enterprise" (Pfriem, 2021; Scholl & Mewes, 2015a) are used. We use the term transformative enterprise because we want to emphasize the enterprise's transformative action and effects and thus their role in firm-level and system-level agency. To conclude, the concept of transformative enterprise is only emerging, findings are dispersed, and economic geography did not use it so far. Given that enterprises are central economic actors in sustainability transformations, economic geography could benefit from a precise description of such enterprise's characteristics. In Table 1 below we summarize how traditional economic geography (left) and the transformation discourse (right) conceptualize enterprises in sustainability transformations.

In this paper, we put the pieces together and join insights on enterprises that may be labelled transformative. Our goal is to define transformative enterprises by identifying and elaborating their characteristics and actions. Thereby we complement conceptualizations of firm-level agency and system-level agency. Hence we ask: *What operationalizable characteristics that refer to transformative enterprises are discussed in the literature? How* can *we define transformative enterprises?* Starting from a literature review, we identify nine key dimensions of transformative enterprises and develop a set of 30 indicators for describing them. This leads us to proposing a definition of transformative enterprises that extends the few and vague existing ones. Finally, we reflect upon the question how these insights can deepen knowledge on enterprises as change agents in economic geography and advance a more critical perspective on economic development and industry transformation.

2 | METHODS

To develop indicators and a definition for transformative enterprises, the first author of this paper conducted a literature review and repeatedly discussed the intermediary and final results with the other authors. In a first step (cf. Figure 1), we collected contributions covering enterprises' orientation towards transformation and strong sustainability by scanning databases (Google Scholar, Web of Science, swisscovery). Because the body of literature that specifically speaks of *transformative enterprises* is small and only includes German-language publications, we decided to use search terms related to the concept of transformative enterprise that were *enterprise*, *entrepreneurship*, *growth*, *degrowth*, *post-growth*, *growth-independent*, *transition*, *transformation*, *sufficiency*, *sustainability* and *sustainable*.[8] For the same reason, we used English and German search terms and included English- and German-language publications. Also, we specified that publications were based on published research and written within the past 11 years (2010–2021). The search was first conducted in November 2020 and extended via snowballing until October 2021. Second, we defined

TABLE 1 How traditional economic geography and the transformation discourse conceptualize enterprises in sustainability transformations

	Traditional economic geography approaches	Transformation discourse
Understanding of sustainability	• Discuss sustainability challenges in the context of green path development, green innovations etc. • Direction of change: Implicitly normative* • Growth-oriented *for example, creation of "good" jobs, income and wealth by enhancing the innovation capacity and growth	• Discuss sustainability challenges as requiring systemic ecological, technological, economic, institutional, and cultural changes • Direction of change: Explicitly normative** • Not primarily growth-oriented ** strong sustainability
Enterprises in sustainability transformations	• Central actors in regional economic restructuring • Creators of new growth paths • Initiators of new (green) technological innovations • Profit-oriented	• Actors in sustainability transformations • Creators of new development paths that break with existing (e.g. growth-oriented) paths • Initiators of technological and social innovations • Broad goals, profit is not the primary focus

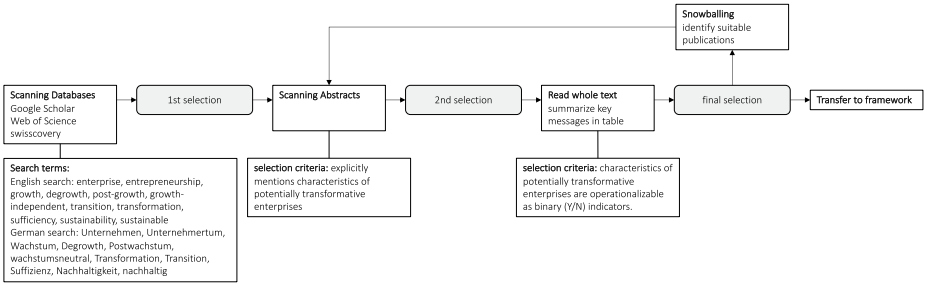

FIGURE 1 The selection process for the reviewed literature

that the publication explicitly mentions characteristics of potentially transformative enterprises and that the latter are operationalizable as binary indicators. Finally, we identified contributions with substantial statements about such enterprises and translated these statements into indicators.[9] We continued this iterative process of reviewing literature and translation into indicators until theoretical saturation was reached at 44 contributions (cf. Appendix, Table A1).

3 | DEFINING TRANSFORMATIVE ENTERPRISES: NINE KEY DIMENSIONS AND 30 INDICATORS

Based on our review we identified nine defining features that can be used to describe potentially transformative enterprises. These are so-called key dimensions, which touch upon three realms (or topic areas): values and basic orientation, enterprise strategies, and relations with stakeholders. For each of the nine key dimensions we determined a set of two to five indicators[10] that specify how the key dimension may operationalize within a particular enterprise. As each indicator either describes innovative activities within existing firms or actions that influence the wider institutional or organizational context, indicators can be attributed to firm-level or system-level agency

(cf. Table 2). For each key dimension, we hereafter discuss major claims from the literature, and state which indicators these relate to. Certain key dimensions are described more extensively because they encompass more indicators.

3.1 | Values and basic orientation

The first realm which helps to differentiate transformative enterprises from conventional ones, concerns values and basic orientation. It encompasses two key dimensions that are *1 Driving mission* and *2 Stability and autonomy*.

TABLE 2 Key dimensions of transformative enterprises and corresponding indicators

Realm	Key dimension	Indicator	Agency
Values & basic orientation	1 Driving mission	1.1 Alternative goals	firm-level
		1.2 Idealism	
		1.3 Role model	
	2 Stability & autonomy	2.1 Sufficiency orientation	
		2.2 Long-term orientation	
		2.3 Autonomous management	
		2.4 Financial independence	
		2.5 Limits to growth	
Strategies	3 Ecological footprint	3.1 Low resource use	
		3.2 Low environmental pollution	
	4 Social obligation	4.1 Care for employees	
		4.2 Social inclusiveness	
	5 Participatory governance	5.1 Participation	
		5.2 Flat hierarchies	
		5.3 Transparency	
		5.4 Alternative ownership	
		5.5 Knowledge exchange	
	6 Alternative products & services	6.1 Niche markets	
		6.2 High quality	
		6.3 Repairable products	
		6.4 Service-orientation	
		6.5 Convivial innovation	
Relations with stakeholders	7 People before profit	7.1 Low wage differentials	
		7.2 Fair prices	
		7.3 Profit redistribution	
	8 Regional embeddedness	8.1 Regionalization	system-level
		8.2 Stakeholder proximity	
		8.3 Strong cooperation	
	9 Change agent	9.1 Initiative for value change	
		9.2 Initiative for industry change	

Note: The latter can be attributed to the concept of firm-level agency and system-level agency.

3.1.1 | Key dimension 1 Driving mission

With the indicator *1.1 Alternative goals* we highlight that directionality in mission seems to be a key feature of enterprises that may be labelled transformative. Alternative business goals, which originate in a business' underpinning values such as social justice and equality, cooperation, autonomy or self-sufficiency (Pansera & Fressoli, 2021), are discussed as perhaps *the* most important characteristic of a transformative enterprise. These goals may be recorded in the founding documents, legal charter, or vision statement. While contributions with a focus on social enterprises stress the explicit aim to benefit the community and to foster societal wellbeing (Bacq & Janssen, 2011; Johanisova & Fraňková, 2017), post-growth scholars also emphasize environmental goals (e.g. Hankammer et al., 2021; Nesterova, 2020a; Nesterova, 2021; Schmid, 2018). They further put forward that social and environmental goals replace "classic" business goals (De Souza & Seifert, 2018; Gebauer et al., 2017; Khmara & Kronenberg, 2018; Naumann, 2017; Nesterova, 2020b; Schubring et al., 2013; Wiefek & Heinitz, 2018): for transformative enterprises, success is not about business growth or profit maximization. Although profit may be necessary to make additional investments etc., it is never the main goal. It appears to be a consensus that an enterprise's goals are crucial for it to become a change agent.

The indicator *1.2 Idealism* circumscribes that the values of an enterprise with transformative potential are strongly influenced by its founders or leaders who are said to follow their ideals, to be visionary, passionate about their business and emotionally attached to it (Burlingham, 2016; Deimling, 2016; Maurer, 2017). This goes along with a heightened sense of accountability for the consequences of entrepreneurial activities (Maurer, 2017; Palzkill et al., 2015; Palzkill-Vorbeck, 2018) and may mean that the leaders forgo business opportunities so as to remain true to themselves (Deimling, 2016; Maurer, 2017). Further, indicator *1.3 Role model* addresses that such idealist founders and leaders also have a role model function (Deimling, 2016; Naumann, 2017). They are not only committed to the enterprise values in their personal lives (Deimling, 2016; Naumann, 2017) but are also pioneers in their business (Maurer, 2017). Engaged and enthusiastic leaders are thus key in transformative enterprises.

3.1.2 | Key dimension 2 Stability and autonomy

This key dimension is multifaceted and therefore encompasses five indicators. The two first indicators, *2.1 Sufficiency orientation* and *2.2 Long-term orientation* emerge from a transformative enterprise's driving mission. Indicator *2.1 Sufficiency orientation* points out that by implementing practices of sufficiency (Gebauer, 2018), so-called transformative enterprises reduce their ecological footprint and alleviate consumerism. At the same time, they maintain stable customer relations and robust internal processes. Several authors discuss decommercialization through sharing, prosumption and engagement in non-market production and provisioning patterns (Gebauer et al., 2017; Johanisova & Fraňková, 2017; Niessen, 2013; Paech, 2017; Pfriem, 2021; Posse, 2015). Others emphasize that transformative enterprises do not use conventional advertising and generally moderate sales and promotion (e.g. Nesterova, 2021; Sommer & Wiefek, 2016; Tschumi et al., 2020). Deceleration and decluttering are also identified in transformative enterprises, which may implement phases of retreat and reflection or count on slow, artisanal production. Some enterprises have a limited product range, consciously forego possibilities to expand sales or to grow otherwise, and seek to reduce the complexity of the organization (Gebauer et al., 2015; Gebauer & Mewes, 2015; Liesen et al., 2013, 2015; Nesterova, 2020b; Palzkill & Schneidewind, 2013; Pfriem, 2021; Pfriem et al., 2015). With the indicator *2.2 Long-term orientation* we suggest that, in addition to applying principles of sufficiency, transformative enterprises often aim to secure the enterprise in the long run. Case studies observe that this means maintaining stable production capacities and numbers of employees (Gebauer et al., 2015) and involves careful investment to avoid sudden and potentially destabilizing growth in production (De Souza & Seifert, 2018; Gebauer & Mewes, 2015; Nesterova, 2021).

To live up to this orientation, these enterprises manage their business autonomously. Indicator *2.3 Autonomous management* describes what Gebauer (2018) summarizes with the sentence *"…entrepreneurs were primarily concerned with preserving or regaining autonomy and control; the decision-making and management scope was supposed to remain within the company […]"* (p. 240). Others (Burlingham, 2016; De Souza & Seifert, 2018; Liesen et al., 2013, 2015; Tschumi et al., 2020) confirm that for an enterprise, to keep autonomous management means to avoid dependencies, be they related to customer structure or financing. Because financial independence seems to be particularly important and allows potentially transformative enterprises to renounce the growth paradigm (Gebauer & Mewes, 2015; Leonhardt et al., 2017; Schubring et al., 2013; Wiefek & Heinitz, 2018), we propose the indicator *2.4 Financial independence*. Possible strategies are using alternative financing models or regional currencies (Gebauer et al., 2015; Mewes & Gebauer, 2015; Nesterova, 2021; Niessen, 2013; Paech, 2012, 2017; Scholl & Mewes, 2015a). Transformative enterprises are likely to avoid debts (De Souza & Seifert, 2018; Gebauer & Mewes, 2015) and to have low borrowing costs (Gebauer et al., 2017) or low shares of foreign capital and interests (Tschumi et al., 2020) which ensures that repaying interest and generating profit does not become a major concern to their entrepreneurial activity. They eschew growth-driving external financing and cover their investments and business activities with own resources (De Souza & Seifert, 2018; Gebauer & Mewes, 2015). Reducing fixed costs (Liesen et al., 2013) and cautious investments (Gebauer & Mewes, 2015) complete this arsenal of strategies for financial independence.

Closely related to financial independence is growth independence. Indicator *2.5 Limits to growth* emphasizes that many transformative enterprises—some of them with an explicit no-growth strategy (Khmara & Kronenberg, 2018)—limit the enterprise size by limiting growth in sales, production, employees etc (Gebauer et al., 2015, e.g. Deimling, 2016; Posse, 2015). The reason for restricting growth can be organizational: some SMEs are satisfied with their current business, and growth may imply instability (De Souza & Seifert, 2018). Growth may moreover mean more (administrative) work, stress and poorer quality of life (Gebauer & Mewes, 2015). Limiting growth can also have ideological reasons: SMEs with the potential to be transformative are said to renounce growth either because they reflect on resource limits and the accompanying limits to growing resource throughput (e.g. Naumann, 2017; Nesterova, 2020a) or because they prefer staying small, local and connected to the community (e.g. Hinton, 2021). In a growth-driven economy, limiting growth may, however, need conscious decisions. Transformative enterprises therefore seek to reduce growth drivers and growth dependence (e.g. Gebauer & Mewes, 2015; Naumann, 2017; Pfriem, 2021; Pfriem et al., 2015). Consequently, transformative enterprises reach managerial goals and success by other means than growth (De Souza & Seifert, 2018; Leonhardt et al., 2017). Instead of scaling up, these enterprises seek to reproduce their business model (Gebauer et al., 2015; Nesterova, 2021; Pansera & Fressoli, 2021; Scholl & Mewes, 2015a).

3.2 | Strategies

The second realm of a transformative enterprise encompasses its strategies. Four key dimensions are part of this realm: *3 Ecological footprint*, *4 Social obligation*, *5 Participatory governance*, and *6 Alternative products and services*.

3.2.1 | Key dimension 3 Ecological footprint

In their enterprise case studies various authors observe high environmental consciousness and low environmental impact (e.g. Gebauer et al., 2015; Hankammer et al., 2021; Nesterova, 2020b; Nesterova, 2021; Pfriem et al., 2015; Wiefek & Heinitz, 2018). With the indicator *3.1 Low resource use*, we summarize that, given their ecological goals, possibly transformative enterprises reduce resource use. They promote process efficiency, technological innovations, and close material cycles, or encourage frugal use and sharing models. Indicator *3.2 Low environmental pollution* takes up that these enterprises moreover reduce environmental pollution by minimizing waste and energy use and

using renewable energies and recyclable, biodegradable or recycled materials and products. The examined literature does, however, not discuss the technological aspects of environmental friendliness at large. Referring to ecological goals and sufficiency orientation, authors rather stress the frugal use of materials and energy in general (e.g. Nesterova, 2021).

3.2.2 | Key dimension 4 Social obligation

The importance of employee well-being is a recurring topic in the reviewed literature. We therefore propose the indicator *4.1 Care for employees* which emphasizes that enterprises that may be called transformative provide work that gives meaning and personal satisfaction to employees (Deimling, 2016; Gebauer, 2018). To achieve this, work must be varied (Gebauer et al., 2015), participation-oriented and enable autonomy and capacity development (ibid., Hankammer et al., 2021). Moreover, it requires appropriate technologies (Hinton, 2021) and may even involve de-specialization (Nesterova, 2020a). Another component of employee well-being are working conditions: transformative enterprises ideally provide lasting employment opportunities (Gebauer, 2018) and improve the work-life balance of employees (Hankammer et al., 2021), for example, with reduced working hours (Hinton, 2021; Nesterova, 2020a, 2020b) or flexible working times (Khmara & Kronenberg, 2018; Nesterova, 2021).

The second indicator in this key dimension, *4.2 Social inclusiveness* highlights that transformative enterprises tend to promote social inclusion (Gebauer, 2018), for instance by training and employing disabled, disempowered, or delinquent people. Social inclusion transcends the boundaries of the enterprise when the latter cooperates with charities (Nesterova, 2021) or supports fair-trade initiatives (Sommer & Wiefek, 2016). Altogether, care for employees goes beyond the boundaries of the working place and the employees' legal protection (Burlingham, 2016).

3.2.3 | Key dimension 5 Participatory governance

With the indicator *5.1 Participation* we summarize that in the analyzed literature many authors find pronounced participation. In their day-to-day business enterprises with transformative potential foster collaborative practices like sharing, co-production or networking (Gebauer et al., 2015, 2017; Pfriem, 2021; Pfriem et al., 2015). Moreover, in decision-making processes, including the development of a mission statement or new products and services, transformative enterprises do not only consider the interests of employees, but also of external stakeholders (Bacq & Janssen, 2011; Gebauer et al., 2017; Khmara & Kronenberg, 2018; Nesterova, 2020a). Indicator *5.2 Flat hierarchies* seizes that such extensive participation goes along with flat hierarchies (Nesterova, 2021), meaning that all enterprise members have an equal say (Naumann, 2017). Decisional power is thus not based on capital ownership, and governance mechanisms do not prioritize investors (Bacq & Janssen, 2011; Khmara & Kronenberg, 2018). Flat hierarchies and democratic decision-making further imply transparency (e.g. Dyllick & Muff, 2016; Gebauer, 2018; Nesterova, 2021; Niessen, 2013) which we describe with indicator *5.3 Transparency*. For an enterprise, transparency can mean that it communicates economic, ecological and social key figures (Posse, 2015; Tschumi et al., 2020; Wiefek & Heinitz, 2018), and that it has traceable procurement chains (Sommer & Wiefek, 2016). Besides that, transformative enterprises may disclose their financing, including performance and advertising costs (Khmara & Kronenberg, 2018). Together with transparency and flat hierarchies, participation is thus distinctive for transformative enterprises.

The indicator *5.4 Alternative ownership* captures that an enterprise's participatory nature may translate into alternative and democratic ownership patterns (e.g. Gebauer, 2018; Nesterova, 2020a; Wiefek & Heinitz, 2018). Possibly transformative enterprises are likely not to be publicly traded shareholder companies (Hinton, 2021; Reichel, 2013; Schubring et al., 2013) because this could compromise their mission and growth independence. Instead, many of them experiment with uncommon organizational forms such as collective enterprise, citizens' cooperative or

community-owned enterprise (e.g. Johanisova & Fraňková, 2017; Pansera & Fressoli, 2021; Tschumi et al., 2020). The last indicator of this key dimension that strongly relates to transparency, is *5.5 Knowledge exchange:* the literature emphasizes that transformative enterprises engage in sharing knowledge and best practices (e.g. Dyllick & Muff, 2016; Gebauer, 2018; Gebauer & Ziegler, 2013), for example, through open-source models and open-license production (e.g. Hinton, 2021; Khmara & Kronenberg, 2018; Niessen, 2013; Pansera & Fressoli, 2021). Together with alternative ownership, this supports the effort to bring changes forward.

3.2.4 | Key dimension 6 Alternative products and services

The two first indicators of this key dimension, *6.1 Niche markets* and *6.2 High quality* suggest that as pioneers many enterprises operate in niche markets and offer high-quality products and services. High quality may be a precondition for surviving in a niche. Particularly small traditional handicraft businesses want to assure high quality standards in the long run (De Souza & Seifert, 2018; Naumann, 2017). Indicator *6.3 Repairable products* addresses that products are designed to last and are repairable which minimizes resource use (e.g. Deimling, 2016; Khmara & Kronenberg, 2018). Besides that, offering durable products is said to reduce growth drivers (Gebauer & Mewes, 2015; Liesen et al., 2015; Mewes & Gebauer, 2015; Tschumi et al., 2020). Regarding repairability, some enterprises may undertake special efforts against planned obsolescence by designing upgradeable products (e.g. Bocken & Short, 2016). With indicator *6.4 Service-orientation* we describe that to prolong product life, potentially transformative enterprises may reorient their offer towards repair and maintenance services or promote sharing solutions (Gebauer et al., 2017; Khmara & Kronenberg, 2018; Paech, 2012). When enterprises shift to offering services instead of products (Gebauer & Mewes, 2015, e.g. Gebauer et al., 2017; Posse, 2015), they reduce demand and save resources at once. In terms of resource use, innovation is discussed as another lever. We propose the indicator *6.5 Convivial innovation* to highlight that transformative enterprises may opt for different types of innovations like "frugal innovations" (Bocken & Short, 2016), open innovations or user-centered innovations (Scholl & Mewes, 2015a). These are not technology-driven but pushed by perceived social and ecological needs (Hinton, 2021; Nesterova, 2020a; Pansera & Fressoli, 2021). Cycles of innovation may moreover be slower and therefore less resource intensive (Gebauer et al., 2017).

3.3 | Relations with stakeholders

The third realm that distinguishes transformative enterprises is their relations with stakeholders. It encompasses three key dimensions: *7 People before profit*, *8 Regional embeddedness* and *9 Change agent*.

3.3.1 | Key dimension 7 People before profit

Several studies highlight the importance of putting people before profit. We describe aspects of this key dimension with three indicators, the first of which is *7.1 Low wage differentials:* two case studies find low wage differentials (Liesen et al., 2015; Sommer & Wiefek, 2016). The reason for this may be ideological. At the same time, it serves to keep fixed costs low. The second indicator, *7.2 Fair prices*, addresses that possibly transformative enterprises do also not offer dumping prices or quantity discount, but have long-term and fix acceptance prices (Gebauer et al., 2015, 2017; Tschumi et al., 2020). With this, they reduce the pressure to rationalize, automatize and expand production to make up for low prices. And finally, the indicator *7.3 Profit redistribution* emphasizes that transformative enterprises limit the distribution of profit to owners or shareholders. They redistribute profit to employees, reinvest into

infrastructure maintenance or support social or ecological projects (Bacq & Janssen, 2011; Gebauer et al., 2015; Johanisova & Fraňková, 2017; Pfriem et al., 2015; Wiefek & Heinitz, 2018). Transformative enterprises thereby demonstrate their commitment to financial fairness.

3.3.2 | Key dimension 8 Regional embeddedness

An enterprise's regional embeddedness is a topic with wide resonance in the literature. The first indicator of this key dimension, *8.1 Regionalization*, addresses that many studies emphasize that enterprises with transformative potential promote regional production, provisioning and consumption patterns (e.g. Paech, 2017; Pfriem et al., 2015; Schneidewind et al., 2012). Rationales for this may be ecological because energy use and transports are minimized (Nesterova, 2021; Paech, 2012; Posse, 2015) or related to an enterprise's no-growth strategy (Hinton, 2021). Some authors also put the community aspect forward: locally embedded enterprises (Hankammer et al., 2021; Johanisova & Fraňková, 2017) feel responsible towards the local community (North, 2016), support it (Nesterova, 2021) and consequently have a regional identity (Pfriem, 2021). Indicator *8.2 Stakeholder proximity* highlights that such embeddedness goes along with close contact between the enterprise and involved stakeholders. Several studies mention that so-called transformative enterprises have strong, long-term, partner-like and trust-based relationships with their customers and suppliers (e.g. De Souza & Seifert, 2018; Khmara & Kronenberg, 2018; Posse, 2015; Schubring et al., 2013; Wiefek & Heinitz, 2018). As a side effect, enterprises may be less dependent on market dynamics (Gebauer et al., 2017). With the indicator *8.3 Strong cooperation* we suggest that close contacts moreover facilitate cooperation between enterprises, which is said to be particularly strong in transformative enterprises (e.g. Hinton, 2021; Khmara & Kronenberg, 2018; Niessen, 2013). They not only share contracts and employees (Gebauer et al., 2017; Mewes & Gebauer, 2015), but may even support potential competitors (Gebauer et al., 2015; Wiefek & Heinitz, 2018). Regional embeddedness thus not only reduces environmental impacts but is socially important to enterprises too.

3.3.3 | Key dimension 9 Change agent

Enterprises labelled transformative are agents of change towards sustainability in two different ways. First, indicator *9.1 Initiative for value change* describes that they are dedicated to initiating changes in values. They for example, encourage employees to share the company values (Khmara & Kronenberg, 2018), carry out educational campaigns (ibid.; Gebauer, 2018) and advocate for reducing consumption and production (e.g. Dyllick & Muff, 2016; Hankammer et al., 2021; Khmara & Kronenberg, 2018; Mewes & Gebauer, 2015). Further, transformative enterprises may implement alternative reporting standards and metrics of success (Niessen, 2013, Posse, 2015) or support environmental or social organizations and initiatives (Khmara & Kronenberg, 2018; Nesterova, 2021). Put differently, these enterprises " *…challenge economic discourses and practices more broadly*" (Schmid, 2018, p. 238).

Second, transformative enterprises are aware of their structural political impact and engage for industry change. With indicator *9.2 Initiative for industry change* we emphasize that possibly transformative enterprises network with like-minded entrepreneurs, influence industry associations or engage in entrepreneurial adjustment policy (e.g. Palzkill & Augenstein, 2017; Palzkill-Vorbeck, 2018; Pfriem, 2021; Posse, 2015; Scholl & Mewes, 2015a). Some of them share professional knowledge and good management practices and select suppliers who comply with the company values (Dyllick & Muff, 2016; Khmara & Kronenberg, 2018; Scholl & Mewes, 2015a). Finally, to raise awareness of their transformative impact, transformative enterprises may carry out PR activities like talks, reports or open house days (Gebauer, 2018). With this, they scale up their effect without necessarily having to grow (Mewes & Gebauer, 2015) and push back unsustainable practices (Pfriem, 2021). This engagement for value change and industry change is what makes an enterprise transformative beyond its boundaries.

3.4 | Synthesis: A definition of transformative enterprises

With a synthesis of the nine key dimensions which resulted from our literature review, we propose a definition of transformative enterprises:

> Transformative enterprises are pioneering SMEs who strive for fundamental changes towards sustainability. They have a social and/or ecological (1) driving mission and are oriented along the values of (2) stability and autonomy. Inside the enterprise, they implement these values through minimizing their (3) ecological footprint, assuming (4) social obligations, introducing (5) participatory governance structures, and offering (6) alternative products and services. The enterprise's core values define how it interacts with stakeholders: transformative enterprises put (7) people before profit, emphasize (8) regional embeddedness and act as (9) change agents. By spreading their vision and taking initiative for industry changes, they trigger or facilitate transformation processes and thereby contribute to sustainable, future-proof economic practices.

Figure 2 illustrates the nine key dimensions. A transformative enterprise's values and basic orientation—represented by key dimensions 1 and 2—are at its core. They resonate with organizational and operational aspects, or with the enterprise strategy described with key dimensions 3–6. Values and basic orientation also shape the enterprise's relations with stakeholders (key dimensions 7, 8 and 9), depicted in the outermost circle. Key dimensions 1 and 2 thus strongly influence all other dimensions. Key dimensions 1–7 can moreover be attributed to firm-level agency while key dimensions 8 and 9 describe system-level agency. This classification facilitates the differentiated examination of agency in individual enterprises.

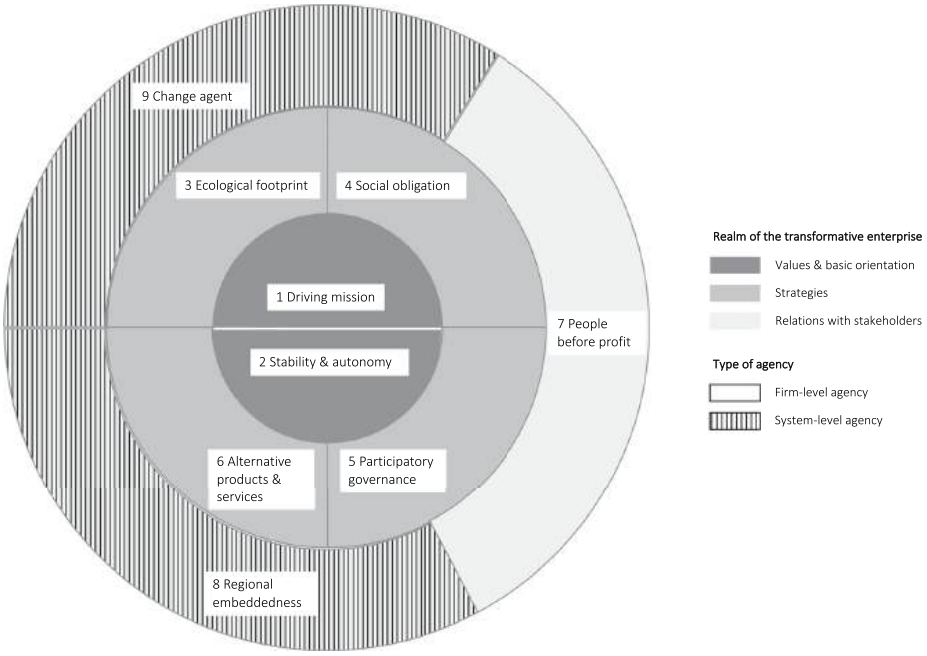

FIGURE 2 Nine key dimensions of transformative enterprises

4 | DISCUSSION

In the previous section we reviewed the literature, operationalized characteristics of potentially transformative enterprises and proposed a definition. With an understanding of transformation that exceeds the premise of a green economy, we join debates on economic development beyond growth (cf. Gibbs & O'Neill, 2017; Martin, 2021; Schulz & Bailey, 2014). At the same time, we complement current conceptualizations of enterprises in sustainability transformations. We show that firm-level agency and system-level agency can go beyond technological innovations and the greening of industries. The focus on SMEs is motivated by their number and importance in industrialized countries (Muller et al., 2021), which makes them key actors for transformative change. Our contribution illuminates SMEs as change agents in times of grand challenges.

Our findings could enrich the engagement with sustainability issues in economic geography and provide fresh points of reference for researchers focusing on SMEs in regional economies. The concept of transformative enterprise offers a micro-perspective of economic actors and their agency—an aspect increasingly discussed by economic geographers (e.g. Baumgartinger-Seiringer et al., 2020; Grillitsch & Sotarauta, 2019). We encourage researchers to take our work as a starting point for more engagement with transformative enterprises, especially empirical studies (cf. Pike et al., 2016). It would be exciting to explore how transformative enterprises, with their firm-level agency and system-level agency, create and alter paths, or become drivers of path-breaking innovations (cf. Gebauer, 2018, p. 245) that require institutional and normative changes (Grillitsch, 2019, p. 684). We also do not yet know what types and aspects of agency are particularly important in this process and what the barriers to and drivers of agency are. Innovation policies too could profit from a new perspective on enterprises: while innovation studies so far mainly aimed at economic growth (Tödtling et al., 2021), a focus on transformative enterprises could reorient attention away from technological innovations towards other types of innovation like slow innovation (Mayer, 2020) or social innovations (e.g. Mayer et al., 2021). This shift would support calls for mission-oriented, responsible or challenge-oriented innovation policies (Tödtling et al., 2021) and is a step towards decoupling innovation from growth (Pansera & Fressoli, 2021).

Turning to the limitations, we want to emphasize that our definition depicts a stylized enterprise. No "real" enterprise will fulfill all 30 indicators and in "real life" enterprises will have to balance their idealism and economic realities (cf. O'Neil & Ucbasaran, 2016). Further improvements of our definition would thus touch on three questions: how can transformative enterprises be delineated from non-transformative ones, that is, how does the continuum from transformative to non-transformative manifest? Are there different types of transformative enterprises? And what challenges and contradictions do they encounter? Answering these questions would imply to clarify relationships and tradeoffs between indicators as well as their weight. Further, other relevant indicators may appear. Moreover, the indicators we described could principally apply to large companies too. Empirical studies drawing on large companies that may be labelled transformative are, however, rare (see e.g. Khmara & Kronenberg, 2018 on Patagonia). Field data could fill these open issues. Given that our work is based on a limited number of studies from the industrialized world, of which only a handful draw on fieldwork, we consider its empirical refinement crucial. This may moreover highlight industry-specific characteristics of transformative enterprises and show barriers to transformative action (cf. Nesterova, 2021). Concurrently, one could examine at what scale enterprises initiate transformative changes. Regarding this, we see potential in opening the view to other research fields concerned with transformation like transition studies, sustainability management or resilience research (cf. Wittmayer & Hölscher, 2017, Heyen & Brohmann, 2017). Our contribution is a starting point for many more fascinating research projects.

5 | CONCLUSION

To date, scholars of economic geography have not substantively engaged with transformative enterprises as change agents that tackle grand societal challenges, and little is therefore known about their characteristics. With our contribution, we address this knowledge gap. Drawing on findings from research fields concerned with

socio-economic transformation, particularly post-growth studies, we operationalized the concept of transformative enterprise. From our literature review, we distilled nine key dimensions and 30 indicators that describe firm-level and system-level agency. We synthetized by proposing a definition for transformative enterprises. With this definition in mind, economic geography scholars could now start engaging with a neglected but important research subject.

Our review confirms some well-known aspects in economic geography like embeddedness or regionality, but also adds fresh ideas that indicate ways forward for the discipline. Firstly, our work provides a micro-perspective on enterprises that are aware of their structural impact and committed to spreading their vision. Contrary to dominant conceptions of firms as profit maximizers, these enterprises are driven by social and environmental goals. Secondly, by showing what strategies transformative enterprises employ and how they relate with stakeholders, we draw a nuanced picture of enterprises that could inspire economic geography in developing concepts to capture economic development beyond growth.

ACKNOWLEDGMENTS

The authors would like to thank the Wyss Academy for Nature at the University of Bern for financial support and the Economic Geography Unit at the University of Bern for insightful discussions. Special thanks go to Andrea Winiger who gave detailed feedback at several stages of the writing process.

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ENDNOTES

[1] Individuals or groups with a crucial role in the process of initiating, designing and implementing processes of change (Kristof, 2010; WBGU, 2011a, p. 419).

[2] The term transformative enterprise ("transformatives Unternehmen") is increasingly used by German-language scholars working on corporate social and environmental responsibility. It appeared around 2015 in a theme issue of the journal *Ökologisches Wirtschaften* on enterprises in socio-ecological transformation (cf. Pfriem et al., 2015; Scholl & Mewes, 2015b) and then became more widespread in publications emanating from the research project *nascent* (https://www.nascent-transformativ.de) which examines the emergence and development of transformative economies in the food system (cf. for example Antoni-Komar et al., 2015, Pfriem, 2021). To the authors knowledge, the term transformative enterprise has not yet been used outside the German-language research community.

[3] The notion of the Great Transformation was first coined by Karl Polanyi in his 1944 book *Great Transformation. The Political and Economic Origins of Our Time* (Polanyi, 2001) and taken up almost 7 decades later by the German Advisory Council on Global Change WBGU in their flagship report *World in Transition. A Social Contract for Sustainability* (WBGU, 2011b).

[4] In sustainability economics, strong sustainability means that natural capital cannot be replaced with other forms of capital (human-made or social) (Stern, 1997). Colloquially and in this publication, strong sustainability is understood as primacy of ecological goals over social and economic ones.

[5] Discussions on the transformation discourse are not uncontroversial: Some scholars point out that it risks getting hollowed out, losing its radical potential (Westman & Castán Broto, 2022).

[6] The difference between the terms "firm" and "enterprise" is not clear cut but in most cases "firm" relates to a relatively larger business while "enterprise" means a smaller one. In our research we speak of "enterprises" because our focus is on SMEs. The EEG literature on the other hand, mostly uses the term "firm". The concepts discussed in this section are equally relevant for firms and enterprises.

[7] Sometimes it has also been called field of degrowth. In the early 2010s, degrowth proponents aimed at intentionally downscaling economic activities (Van Den Bergh & Kallis, 2012), whereas post-growth highlighted growth independence (Seidl & Zahrnt, 2010). Schmelzer and Vetter (2019, p. 17) claim that the terms degrowth and post-growth may be used interchangeably as both aim at growth independence, resource use within planetary boundaries and social well-being.

[8] We did not include the search term *green entrepreneurship* because dominant discourses—especially those in policy—do only propose incremental changes without fundamentally questioning the dominance of economic paradigms and business models (O'Neill & Gibbs, 2016, p. 1730). These voices emphasize absolute decoupling, green growth, technological advances, and the "greening" of existing industries as solutions to pressing ecological and societal challenges. The

feasibility of absolute decoupling is, however, increasingly questioned (e.g. Haberl et al., 2020). Similarly, we did not include the literature on *circular economy* because it is mostly based on technical thinking and quite incremental regarding the development of enterprises.

[9] A full summary table of text statements and derived indicators is provided in the Bern Open Repository and Information System BORIS.

[10] An extensive list of indicators, including their description, possible implications, related indicators, and references can be found in the Bern Open Repository and Information System BORIS.

REFERENCES

Antoni-Komar, I., Kropp, C., Parch, N., & Pfriem, R. (Eds.). (2015). *Transforamtive Unternehmen und die Wende in der Ernährungswirtschaft* (p. 492). Metropolis.

Asara, V., Otero, I., Demaria, F., & Corbera, E. (2015). Socially sustainable degrowth as a social–ecological transformation: Repoliticizing sustainability. *Sustainability Science*, *10*(3), 375–384. https://doi.org/10.1007/s11625-015-0321-9

Bacq, S., & Janssen, F. (2011). The multiple faces of social entrepreneurship: A review of definitional issues based on geographical and thematic criteria. *Entrepreneurship & Regional Development*, *23*(5–6), 373–403. https://doi.org/10.1080/08985626.2011.577242

Baumgartinger-Seiringer, S., Miörner, J., & Trippl, M. (2020). Towards a stage model of regional industrial path transformation. *Industry & Innovation*, *28*(2), 1–22. https://doi.org/10.1080/13662716.2020.1789452

Bocken, N. M. P., & Short, S. W. (2016). Towards a sufficiency-driven business model: Experiences and opportunities. *Environmental Innovation and Societal Transitions*, *18*, 41–61. https://doi.org/10.1016/j.eist.2015.07.010

Burlingham, B. (2016). *Small giants. Companies that choose to Be Great instead of big* (p. 304). Portfolio. 10th anniv.

Coenen, L., Hansen, T., & Rekers, J. V. (2015). Innovation policy for grand challenges. An economic geography perspective. *Geography Compass*, *9*, 483–496. https://doi.org/10.1111/gec3.12231

D'Alisa, G., Demaria, F., & Kallis, G. (Eds.). (2015). *Degrowth: A vocabulary for a new era* (1st ed., p. 248). Routledge.

Deimling, D. (2016). Sinnstrukturen und Muster nachhaltiger Unternehmen im Kontext der Wachstumskritik - Eine Untersuchung unter Einsatz einer Systemaufstellung. In G. Müller-Christ (Ed.), (p. 363). LIT Verlag GmbH & Co. KG. https://premium-cola.de/downloads/wissenschaft/Dissertation_Deimling_Druck.pdf

De Souza, R. R., & Seifert, R. E. (2018). Understanding the alternative of not growing for small mature businesses. *Management Revue*, *29*(4), 333–348. https://doi.org/10.5771/0935-9915-2018-4-333

Donald, B., & Gray, M. (2019). The double crisis: In what sense a regional problem? *Regional Studies*, *53*(2), 297–308. https://doi.org/10.1080/00343404.2018.1490014

Dyllick, T., & Muff, K. (2016). Clarifying the meaning of sustainable business: Introducing a typology from business-as-usual to true business sustainability. *Organization & Environment*, *29*(2), 156–174. https://doi.org/10.1177/1086026615575176

Gebauer, J. (2018). Towards growth-independent and post-growth-oriented entrepreneurship in the SME sector. *Management Revue*, *29*(3), 230–256. https://doi.org/10.5771/0935-9915-2018-3-230

Gebauer, J., Lange, S., & Posse, D. (2017). Wirtschaftspolitik für Postwachstum auf Unternehmensebene: Drei Ansätze zur Gestaltung. In F. Adler & U. Schachtschneider (Eds.), *Postwachstumspolitiken: Wege zur wachstumsunabhängigen Gesellschaft* (pp. 239–251). Oekom.

Gebauer, J., & Mewes, H. (2015). Qualität und Suffizienz in stabilitätsorientierten KMU. Unternehmensansätze für die Postwachstumsgesellschaft. *uwf UmweltWirtschaftsForum*, *23*(1–2), 33–40. https://doi.org/10.1007/s00550-015-0352-9

Gebauer, J., Mewes, H., & Dietsche, C. (2015). Wir sind so frei. Elf Unternehmen lösen sich vom Wachstumspfad (p. 36). https://www.ioew.de/fileadmin/user_upload/BILDER_und_Downloaddateien/Publikationen/2015/Wir_sind_so_frei_-_Elf_Postwachstumspioniere.pdf

Gebauer, J., & Ziegler, R. (2013). Gemeinsam sind wir groß. Kollaboration als Weg für Postwachstumsunternehmen. *Ökologisches Wirtschaften*, *28*(1), 21–22. https://doi.org/10.14512/oew.v28i1.1254

Gibbs, D., & O'Neill, K. (2017). Future green economies and regional development: A research agenda. *Regional Studies*, *51*(1), 161–173. https://doi.org/10.1080/00343404.2016.1255719

Grenzdörffer, S. M. (2021). Transformative perspectives on labour geographies – The role of labour agency in processes of socioecological transformations. *Geography Compass*, *15*(6), 1–16. https://doi.org/10.1111/gec3.12565

Grillitsch, M. (2019). Following or breaking regional development paths: On the role and capability of the innovative entrepreneur. *Regional Studies*, *53*(5), 681–691. https://doi.org/10.1080/00343404.2018.1463436

Grillitsch, M., & Sotarauta, M. (2019). Trinity of change agency, regional development paths and opportunity spaces. *Progress in Human Geography*, *44*(4), 1–20. https://doi.org/10.1177/0309132519853870

Haberl, H., Wiedenhofer, D., Virág, D., Kalt, G., Plank, B., Brockway, P., Fishman, T., Hausknost, D., Krausmann, F., Leon-Gruchalski, B., Mayer, A., Pichler, M., Schaffartzik, A., Sousa, T., Streeck, J., & Creutzig, F. (2020). A systematic

review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: Synthesizing the insights. *Environmental Research Letters*, *15*(6), 065003. https://doi.org/10.1088/1748-9326/ab842a

Hankammer, S., Kleer, R., Mühl, L., & Euler, J. (2021). Principles for organizations striving for sustainable degrowth: Framework development and application to four B Corps. *Journal of Cleaner Production*, *300*, 126818. https://doi.org/10.1016/j.jclepro.2021.126818

Hassink, R., Isaksen, A., & Trippl, M. (2019). Towards a comprehensive understanding of new regional industrial path development. *Regional Studies*, *53*(11), 1636–1645. https://doi.org/10.1080/00343404.2019.1566704

Heyen, D. A., & Brohmann, B. (2017). Konzepte grundlegenden gesellschaftlichen Wandels und seiner Gestaltung Richtung Nachhaltigkeit - ein Überblick über die aktuelle Transformationsliteratur. In J. Rückert-John & M. Schäfer (Eds.), *Governance für eine Gesellschaftstransformation. Herausforderungen des Wandels in Richtung nachhaltige Entwicklung* (pp. 69–86). Springer VS. https://doi.org/10.1007/978-3-658-16560-4

Hinton, J. (2021). Five key dimensions of post-growth business: Putting the pieces together. *Futures*, *131*, 102761. https://doi.org/10.1016/j.futures.2021.102761

Isaksen, A., Jakobsen, S. E., Njøs, R., & Normann, R. (2018). Regional industrial restructuring resulting from individual and system agency. *Innovation: The European Journal of Social Science Research*, *32*(1), 48–65. https://doi.org/10.1080/13511610.2018.1496322

Isaksen, A., Trippl, M., & Mayer, H. (2022). Regional innovation systems in an era of grand societal challenges: Reorientation versus transformation. *European Planning Studies*, *30*(11), 2125–2138. https://doi.org/10.1080/09654313.2022.2084226

Jackson, T. (2017). *Prosperity without growth: Foundations for the economy of tomorrow* (2nd ed., p. 310). Routledge.

Johanisova, N., & Fraňková, E. (2017). Eco-social enterprises. In C. L. Spash (Ed.), *Routledge handbook of ecological economics: Nature and society* (pp. 507–516). Routledge.

Jolly, S., Grillitsch, M., & Hansen, T. (2020). Agency and actors in regional industrial path development. A framework and longitudinal analysis. *Geoforum*, *111*, 176–188. https://doi.org/10.1016/j.geoforum.2020.02.013

Khmara, Y., & Kronenberg, J. (2018). Degrowth in business: An oxymoron or a viable business model for sustainability? *Journal of Cleaner Production*, *177*, 721–731. https://doi.org/10.1016/j.jclepro.2017.12.182

Kristof, K. (2010). *Wege zum wandel: Wie wir gesellschaftliche veränderungen erfolgreicher gestalten können*. 1. Auflage, (p. 160). Oekom Verlag.

Kyllingstad, N. (2020). *The role of firm-level actors and systemlevel actors in processes of new regional industrial path development* (p. 146). University of Agder.

Leonhardt, H., Juschten, M., & Spash, C. L. (2017). To grow or not to grow? That is the question. Lessons for social ecological transformation from small-medium enterprises. *GAIA*, *26*(3), 269–276. https://doi.org/10.1126/scitranslmed.aar2442

Liesen, A., Dietsche, C., & Gebauer, J. (2013). Wachstumsneutrale Unternehmen. Pilotstudie zur Unternehmensperspektive im Postwachstumsdiskurs. *Schriftenreihe des IÖW*, *205/13*(1), 38. https://doi.org/10.14512/oew.v28i1.1251

Liesen, A., Dietsche, C., & Gebauer, J. (2015). Successful non-growing companies (pp. 1–32).

Markusen, A. (1994). Studying regions by studying firms. *The Professional Geographer*, *46*(4), 477–490. https://doi.org/10.1111/j.0033-0124.1994.00477.x

Martin, R. (2014). Path dependence and the spatial economy: A key concept in retrospect and prospect. In M. M. Fischer & P. Nijkamp (Eds.), *Handbook of regional science* (pp. 609–629). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-23430-9_34

Martin, R. (2021). Rebuilding the economy from the Covid crisis: Time to rethink regional studies? *Regional Studies, Regional Science*, *8*(1), 143–161. https://doi.org/10.1080/21681376.2021.1919191

Maurer, C. (2017). *Beseelte unternehmerinnen* (p. 208). Zytglogge.

Mayer, H. (2020). Slow innovation in Europe's peripheral regions: Innovation beyond acceleration. In S. Döringer & J. Eder (Eds.), *Schlüsselakteure der Regionalentwicklung: Welche Perspektiven bietet Entrepreneurship für ländliche Räume?* (pp. 9–22). Verlag der östereichischen Akademie der Wissenschaften.

Mayer, H., Tschumi, P., Perren, R., Seidl, I., Winiger, A., & Wirth, S. (2021). How do social innovations contribute to growth-independent territorial development? Case studies from a Swiss mountain region. *Die Erde*, *152*, 218–231. https://doi.org/10.12854/erde-2021-592

Mewes, H., & Gebauer, J. (2015). Transformative Potenziale von Unternehmen, die nicht wachsen wollen. *Ökologisches Wirtschaften - Fachzeitschrift*, *30*(3), 27. https://doi.org/10.14512/oew300327

Muller, P., Devnani, S., Ladher, R., Cannings, J., Murphy, E., Robin, N., Illan, S.R., Aranda, F., Gorgels, S., Priem, M., Smid, S., Bohn, N. U., Lefebvre, V., & Frizis, I. (2021). Annual report on European SMEs 2020/2021 (pp. 1–175). https://ec.europa.eu/docsroom/documents/46062

Naumann, V. (2017). *Bewusste Begrenzung von Unternehmenswachstum. Strategien und Problemanalyse von Postwachstumsunternehmen am Beispiel von Premium Cola und Quijote* (p. 169). Universität Hamburg.

Nesterova, I. (2020a). Degrowth business framework: Implications for sustainable development. *Journal of Cleaner Production*, *262*, 1–10. https://doi.org/10.1016/j.jclepro.2020.121382

Nesterova, I. (2020b). *Small business transition towards degrowth* (p. 346). University of Derby.

Nesterova, I. (2021). Small firms as agents of sustainable change. *Futures*, *127*, 102705. https://doi.org/10.1016/j.futures.2021.102705

Niessen, J. (2013). *Pioneering business beyond growth? A multi-case study of small enterprises in Germany* (p. 116). Universität Freiburg i. Br.

North, P. (2016). The business of the anthropocene? Substantivist and diverse economies perspectives on SME engagement in local low carbon transitions. *Progress in Human Geography*, *40*(4), 437–454. https://doi.org/10.1177/0309132515585049

O'Neil, I., & Ucbasaran, D. (2016). Balancing "what matters to me" with "what matters to them": Exploring the legitimation process of environmental entrepreneurs. *Journal of Business Venturing*, *31*(2), 133–152. https://doi.org/10.1016/j.jbusvent.2015.12.001

O'Neill, K., & Gibbs, D. (2016). Rethinking green entrepreneurship – Fluid narratives of the green economy. *Environment and Planning A*, *48*(9), 1727–1749. https://doi.org/10.1177/0308518X16650453

Paech, N. (2012). *Nachhaltiges Wirtschaften jenseits von Innovationsorientierung und wachstum: Eine unternehmensbezogene transformationstheorie*. 2. Auflage, (p. 491). Metropolis-Verlag.

Paech, N. (2017). Unternehmerische Nachhaltigkeit aus Sicht der Postwachstumsökonomik. In W. Keck (Ed.), *CSR und Kleinstunternehmen* (pp. 287–302). Springer. https://doi.org/10.1007/978-3-662-53628-5_20

Palzkill, A., & Augenstein, K. (2017). Business model resilience – understanding the role of companies in societal transformation processes. *uwf UmweltWirtschaftsForum*, *25*(1–2), 61–70. https://doi.org/10.1007/s00550-017-0458-3

Palzkill, A., & Schneidewind, U. (2013). Suffizienz als business case. *Ökologisches Wirtschaften*, *28*(1), 23–24. https://doi.org/10.14512/oew.v28i1.1263

Palzkill, A., Wanner, M., & Markscheffel, F. (2015). Suffizienz als geschäftsmodell. *uwf UmweltWirtschaftsForum*, *23*(1–2), 69–76. https://doi.org/10.1007/s00550-015-0353-8

Palzkill-Vorbeck, A. (2018). *Geschäftsmodell- Resilienz. Bezugsrahmen für das strategische Verständnis von Unternehmen in gesellschaftlichen Umbruchprozessen* (p. 214). Springer Gabler. https://doi.org/10.1007/978-3-658-19644-8

Pansera, M., & Fressoli, M. (2021). Innovation without growth: Frameworks for understanding technological change in a post-growth era. *Organization*, *28*(3), 380–404. https://doi.org/10.1177/1350508420973631

Pfriem, R. (2021). Transformative Unternehmen und die Veränderung der Unternehmenslandschaft. In *Die Neuerfindung des Unternehmertums. Solidarische Ökonomie, radikale Demokratie und kulturelle Evolution* (pp. 265–300). Metropolis-Verlag.

Pfriem, R., Antoni-Komar, I., & Lautermann, C. (2015). Transformative unternehmen. *Ökologisches Wirtschaften - Fachzeitschrift*, *30*(3), 18. https://doi.org/10.14512/oew300318

Pike, A., MacKinnon, D., Cumbers, A., Dawley, S., & McMaster, R. (2016). Doing evolution in economic geography. *Economic Geography*, *92*(2), 123–144. https://doi.org/10.1080/00130095.2015.1108830

Polanyi, K. (2001). *The Great transformation: The political and economic Origins of our time* (2nd ed., p. 360). Beacon Press.

Posse, D. (2015). *Zukunftsfähige Unternehmen in einer Postwachstumsgesellschaft* (p. 132). Vereinigung für Ökologische Ökonomie e.V.

Reichel, A. (2013). Das Ende des Wirtschaftswachstums, wie wir es kennen. *Ökologisches Wirtschaften*, *28*(1), 15–18. https://doi.org/10.14512/oew.v28i1.1262

Schmelzer, M., & Vetter, A. (2019). *Degrowth/Postwachstum zur Einführung* (p. 256). Junius Verlag GmbH.

Schmid, B. (2018). Structured diversity: A practice theory approach to post-growth organisations. *Management Revue*, *29*(3), 281–310. https://doi.org/10.5771/0935-9915-2018-3-281

Schmid, B. (2019). Degrowth and postcapitalism: Transformative geographies beyond accumulation and growth. *Geography Compass*, *13*(11), 1–15. https://doi.org/10.1111/gec3.12470

Schneidewind, U. (2019). *Die Grosse Transformation: eine Einführung in die Kunst gesellschaftlichen Wandels*. 3. Auflage, (p. 528). Fischer Taschenbuch.

Schneidewind, U., Palzkill, A., & Scheck, H. (2012). Der Beitrag von Unternehmen zur großen Transformation. In R. Hahn, H. Janzen, & D. Matten (Eds.), *Die gesellschaftliche Verantwortung des Unternehmens: Hintergründe, Schwerpunkte und Zukunftsperspektiven* (pp. 497–528). Schäffer-Poeschel.

Scholl, G., & Mewes, H. (2015a). Unternehmen als Mitgestalter sozial-ökologischer Transformation: Thesen des Instituts für ökologische Wirtschaftsforschung (IÖW). *Ökologisches Wirtschaften - Fachzeitschrift*, *30*(3), 15. https://doi.org/10.14512/oew300315

Scholl, G., & Mewes, H. (2015b). Unternehmen in der sozial-ökologischen Transformation. *Ökologisches Wirtschaften - Fachzeitschrift*, *30*(3), 14. https://doi.org/10.14512/oew300314

Schubring, V., Posse, D., Bozsoki, I., & Buschmann, C. (2013). Unternehmen und Postwachstum: Das Beispiel Premium-Cola. *Ökologisches Wirtschaften*, *28*(1), 19–20. https://doi.org/10.14512/oew.v28i1.1253

Schulz, C., & Bailey, I. (2014). The green economy and post-growth regimes: Opportunities and challenges for economic geography. *Geografiska Annaler, Series B: Human Geography*, *96*(3), 277–291. https://doi.org/10.1111/geob.12051

Seidl, I., & Zahrnt, A. (Eds.). (2010). *Postwachstumsgesellschaft: Konzepte für die Zukunft* (p. 247). Metropolis-Verlag.

Sommer, B., & Wiefek, J. (2016). Kein richtiges Leben im falschen? Wachstumsneutrale Unternehmen in der Wachstumswirtschaft. *Beitrag zur Veranstaltung "Neue Trends der Umweltsoziologie" der Sektion Umweltsoziologie – organisiert von Matthias Groß, 1–10*.

Steen, M. (2016). Reconsidering path creation in economic geography: Aspects of agency, temporality and methods. *European Planning Studies*, *24*(9), 1605–1622. https://doi.org/10.1080/09654313.2016.1204427

Stern, D. I. (1997). The capital theory approach to sustainability: A critical appraisal. *Journal of Economic Issues*, *31*(1), 145–173. https://doi.org/10.1080/00213624.1997.11505895

Taylor, M., & Asheim, B. (2001). The concept of the firm in economic geography. *Economic Geography*, *77*(4), 315–328. https://doi.org/10.1111/j.1944-8287.2001.tb00167.x

Tödtling, F., Trippl, M., & Desch, V. (2021). New directions for RIS studies and policies in the face of grand societal challenges. *European Planning Studies*, *30*(11), 1–18. https://doi.org/10.1080/09654313.2021.1951177

Trippl, M., Baumgartinger-Seiringer, S., Frangenheim, A., Isaksen, A., & Rypestøl, J. O. (2020). Unravelling green regional industrial path development: Regional preconditions, asset modification and agency. *Geoforum*, *111*, 189–197. https://doi.org/10.1016/j.geoforum.2020.02.016

Tschumi, P., Winiger, A., Wirth, S., Mayer, H., & Seidl, I. (2020). Wachstumsunabhängigkeit durch Soziale Innovationen? Eine Analyse potenzieller Wachstumswirkungen von Sozialen Innovationen im Schweizer Berggebiet. In B. Lange, M. Hülz, B. Schmid, & C. Schulz (Eds.), *Postwachstumsgeographien. Raumbezüge diverser und alternativer Ökonomien* (pp. 117–137). transcript Verlag. https://doi.org/10.14361/9783839451809

Van Den Bergh, J. C. J. M., & Kallis, G. (2012). Growth, a-growth or degrowth to stay within planetary boundaries? *Journal of Economic Issues*, *46*(4), 909–920. https://doi.org/10.2753/JEI0021-3624460404

WBGU. (2011a). *Hauptgutachten. Welt im Wandel: Gesellschaftsvertrag für eine Große Transformation*. 2. Auflage, (p. 422). Wissenschaftlicher Beirat Globale Umweltveränderungen (WGBU).

WBGU. (2011b). *World in transition. A social contract for sustainability* (p. 396). German Advisory Council on Global Change WBGU.

Westman, L., & Castán Broto, V. (2022). Urban transformations to keep all the same: The power of ivy discourses. *Antipode*, *54*(4), 1320–1343. https://doi.org/10.1111/anti.12820

Wiefek, J., & Heinitz, K. (2018). Common good-oriented companies: Exploring corporate values, characteristics and practices that could support a development towards degrowth. *Management Revue*, *29*(3), 311–331. https://doi.org/10.5771/0935-9915-2018-3-311

Wittmayer, J., & Hölscher, K. (2017). *Transformationsforschung. Definitionen, ansätze, methoden* (p. 125). Dessau-Rosslau. http://www.umweltbundesamt.de/publikationen

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How to cite this article: Hug, M., Mayer, H., & Seidl, I. (2022). Transformative enterprises: Characteristics and a definition. *Geography Compass*, *16*(12), e12667. https://doi.org/10.1111/gec3.12667

APPENDIX

TABLE A1 Overview of the reviewed literature

Paper Nr.	Author, year	Title	Journal/Type of publication	Concepts
1	Bacq & Janssen, 2011	The multiple faces of social entrepreneurship: A review of definitional issues based on geographical and thematic criteria	Entrepreneurship and regional development	Social entrepreneurship Social entrepreneur Social entrepreneurship organization
2	Bocken & Short, 2016	Towards a sufficiency-driven business model: Experiences and opportunities	Environmental innovation and societal transitions	Business case for sufficiency
3	Burlingham, 2016	Small giants. Companies that choose to be great instead of big	Book	Small giants
4	De Souza & Seifert, 2018	Understanding the alternative of not growing for small mature businesses	Management revue	Small mature business
5	Deimling, 2016	Sinnstrukturen und Muster nachhaltiger Unternehmen im Kontext der Wachstumskritik - Eine Untersuchung unter Einsatz einer Systemaufstellung	Book (dissertation)	Growth-neutral enterprises
6	Dyllick & Muff, 2016	Clarifying the meaning of sustainable business: Introducing a typology from business-as-usual to true business sustainability	Organization and environment	Sustainable business Business sustainability
7	Gebauer & Mewes, 2015	Qualität und Suffizienz in stabilitätsorientierten KMU. Unternehmensansätze für die Postwachstumsgesellschaft.	UmweltWirtschaftsForum (SustainabilityManagementForum)	Stability-oriented SME
8	Gebauer, 2018	Towards growth-independent and post-growth-oriented entrepreneurship in the SME sector	Management revue	Growth-independent entrepreneurship Post-growth-oriented entrepreneurship
9	Gebauer et al., 2017	Wirtschaftspolitik für Postwachstum auf Unternehmensebene: Drei Ansätze zur Gestaltung	Book chapter	Post-growth enterprise
10	Gebauer et al., 2015	Wir sind so frei. Elf Unternehmen lösen sich vom Wachstumspfad	Booklet (published by Institut für ökologishe Wirtschaftsforschung IÖW)	Post-growth pioneer

TABLE A1 (Continued)

Paper Nr.	Author, year	Title	Journal/Type of publication	Concepts
11	Gebauer & Ziegler, 2013	Gemeinsam sind wir gross. Kollaboration als Weg für Poswachstumsunternehmen	Ökologisches Wirtschaften	Social entrepreneur Post-growth enterprise
12	Hankammer et al., 2021	Principles for organizations striving for sustainable degrowth: Framework development and application to 4 B corps	Journal of cleaner production	Organization approaching degrowth
13	Hinton, 2021	Five key dimensions of post-growth business: Putting the pieces together	Futures	Post-growth business
14	Johanisova & Frankova, 2017	Eco-social enterprises	Book chapter	Eco-social enterprise
15	Khmara & Kronenberg, 2018	Degrowth in business: An oxymoron or a viable business model for sustainability?	Journal of cleaner production	Degrowth company
16	Leonhardt et al., 2017	To grow or not to grow? That is the question. Lessons for social ecological transformation from small-medium enterprises	GAIA	Non-growing firms
17	Liesen et al., 2013	Wachstumsneutrale Unternehmen. Pilotstudie zur Unternehmensperspektive im Postwachstumsdiskurs	Schriftenreihe des Instituts für Ökologische Wirtschaftsforschung IÖW	Growth-neutral enterprise
18	Liesen et al., 2015	Successful non-growing companies	Research paper (humanistic management network, research paper No. 25/15)	Non-growing company
19	Maurer, 2017	Beseelte UnternehmerInnen. Plädoyer für einen Wandel in der Wirtschaft.	Book	Beseelte UnternehmerInnen
20	Mewes & Gebauer, 2015	Transformative Potenziale von Unternehmen, die nicht wachsen wollen	Ökologisches Wirtschaften	Post-growth pioneers
21	Naumann, 2017	Bewusste Begrenzung von Unternehmenswachstum. Strategien und Problemanalyse von Postwachstumsunternehmen am Beispiel von Premium Cola und Quijote.	Masters thesis (M.A. International business and sustainability)	Post-growth enterprise
22	Nesterova, 2020a	Degrowth business framework: Implications for sustainable development	Journal of cleaner production	Degrowth business
23	Nesterova, 2020b	Small business transition towards degrowth	Dissertation (university of derby)	Degrowth business

(Continues)

TABLE A1 (Continued)

Paper Nr.	Author, year	Title	Journal/Type of publication	Concepts
24	Nesterova, 2021	Small firms as agents of sustainable change	Futures	Radical small firm
25	Niessen, 2013	Pioneering business beyond growth? A multi-case study of small enterprises in Germany	Master's thesis (environmental governance)	Pioneering business beyond growth
26	North, 2016	The business of the anthropocene? Substantivist and diverse economies perspectives on SME engagement in local low carbon transitions	Progress in human geography	Change agent
27	Paech, 2012	Nachhaltiges Wirtschaften jenseits von Innovationsorientierung und Wachstum. Eine unternehmensbezogene Transformationstheorie.	Book (habilitation)	Growth-neutral enterprises
28	Paech, 2017	Unternehmerische Nachhaltigkeit aus Sicht der Postwachstumsökonomik	Book chapter	Growth-neutral enterprise
29	Palzkill & Schneidewind, 2013	Suffizienz als business case	Ökologisches Wirtschaften	Business case for sufficiency (suffizienzbasierts Geschäftsmodell)
30	Palzkill & Augenstein, 2017	Busines model resilience - understanding the role of companies in societal transformation processes	UmweltWirtschaftsForum (SustainabilityManagementForum)	Business model resilience (BMR)
31	Palzkill-Vorbeck, 2018	Geschäftsmodell-Resilienz. Bezugsrahmen für das Verständnis von Unternehmen in gesellschaftlichen Umbruchprozessen	Book (dissertation)	Business model resilience (BMR)
32	Palzkill et al., 2015	Suffizienz als Geschäftsmodell. Die Bedeutung von Socio-Entrepreneurship-Initiativen am Beispiel von Utopiastadt Wuppertal	UmweltWirtschaftsForum (SustainabilityManagementForum)	Social enterprise Social entrepreneurship
33	Pansera & Fressoli, 2021	Innovation without growth: Technological change in a post-growth era	Organization	Post-growth organization
34	Pfriem et al., 2015	Transformative Unternehmen	Ökologisches Wirtschaften	Transformative enterprise
35	Pfriem, 2021	Transforamtive Unternehmen und die Veränderung der Unternehmenslandschaft	Book chapter	Transformative enterprise

TABLE A1 (Continued)

Paper Nr.	Author, year	Title	Journal/Type of publication	Concepts
36	Posse, 2015	Zukunftsfähige Unternehmen in einer Postwachtumsgesellschaft. Eine theoretische und empirische Untersuchung	Book (dissertation)	Future-proof enterprise
37	Reichel, 2013	Das Ende des Wirtschaftswachstums, wie wir es kennen	Ökologisches Wirtschaften	-
38	Schmid, 2018	Structured diversity: A practice theory approach to post-growth organizations	Management revue	Post-growth organization
39	Schneidewind et al., 2012	Der Beitrag von Unternehmen zur grossen Transformation	Book	Business case for sufficiency (suffizienzbasierts Geschäftsmodell)
40	Scholl & Mewes, 2015	Unternehmen als Mitgestalter sozial-ökologischer Transformation	Ökologisches Wirtschaften	Transformative enterprise
41	Schubring et al., 2013	Unternehmen und Postwachstum: Das Beispiel Premium-Cola	Ökologisches Wirtschaften	Post-growth enterprise
42	Sommer & Wiefek, 2016	Kein richtiges Leben im falschen? Wachstumsneutrale Unternehmen in der wachstumswirtschaft	Beitrag zur Veranstaltung »Neue Trends in der Umweltsoziologie« der Sektion Umweltsoziologie - organisiert von Matthias Groß	Growth-neutral enterprise
43	Tschumi et al., 2020	Wachstumsunabhängigkeit durch Soziale Innovationen? Eine Analyse potenzieller Wachstumswirkungen von Sozialen Innovationen im Schweizer Berggebiet	Book chapter	Growth-independency
44	Wiefek & Heinitz, 2018	Common-good-oriented companies: Exploring corporate values, characteristics and practices that could support a development towards degrowth	Management revue	Common-good-oriented company

6 Transformative firm-level agency

Article 2

Full title: Transformative firm-level agency: A case study of small and medium-sized enterprises (SMEs) in the Swiss wood-processing industry

Authors: Miriam Hug, Heike Mayer, Irmi Seidl

Journal: Progress in Economic Geography

Status: Published

Progress in Economic Geography 2 (2024) 100020

Contents lists available at ScienceDirect

Progress in Economic Geography

journal homepage: www.journals.elsevier.com/progress-in-economic-geography

Transformative firm-level agency: A case study of small and medium-sized enterprises (SMEs) in the Swiss wood-processing industry

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ARTICLE INFO

Keywords:
Transformative enterprise | agency | wood-processing industry | enterprise types | sustainability transformation

ABSTRACT

This paper investigates different enterprise types as potential agents of transformative change in the wood-processing industry. To do so, it combines the concept of transformative enterprise with recent accounts of agency in evolutionary economic geography. We examine small and medium-sized enterprises (SMEs) in the wood-processing industry because by using a renewable resource that stores CO_2 and has the potential to replace polluting materials, they could become frontrunners in sustainability transformations through a wood-based bioeconomy. Empirically, we draw on a qualitative case study with 24 wood-processing SMEs in the Canton of Bern, Switzerland. Based on the concept of transformative enterprise, we identify five enterprise types: silent ecologists, social pioneers, visionary nonconformists, ambitious entrepreneurs, and pragmatist traditionalists. The first four types show many characteristics indicating transformative firm-level agency while only the ambitious entrepreneurs seem capable of inducing changes at the system-level. This is due to several limits of change agency, which we also illuminate. Overall, our study sheds light on the heterogeneity of firms as change agents in the context of sustainability transformation.

1. Introduction

Small and medium-sized enterprises (SMEs) in the Swiss wood-processing industry may become change agents in advancing sustainable industrial restructuring because they use a renewable resource that stores CO_2 and can replace polluting materials like concrete. These SMEs could be regarded as agents of change, a topic that has been prominent in the economic geography literature. However, it is unclear how firms differ regarding their internal characteristics, their micro-level practices and their orientation towards deep-seated sustainability transformation that includes ecological and social aspects. Thus, a focus on sustainability in SMEs in a resource-based industry that is at the core of the bioeconomy is quite relevant.

Agents of change have become an important focus in the strand of evolutionary economic geography (EEG) that draws on agency perspectives. Agency perspectives are increasingly mobilized to explain micro-level processes of industrial restructuring (Grillitsch & Sotarauta, 2019, p. 2). In other words, agency perspectives help illuminate why and how change happens or not. They examine actors and explain how they change or maintain existing structures with their agency, defined as *"the ability of people to act, usually regarded as emerging from consciously held intentions, and as resulting in observable effects in the human world"* (Gregory, Johnston, Geraldine, Watts, & Whatmore, 2009, p. 347). EEG scholars use the notion of path development to characterize industrial restructuring and posit that a region's history and former industrial structure influence its current industrial activity (Isaksen et al., 2018). In discussions on sustainability transformations, authors introduced the concept of green path development that describes the rise of new green industries or the "greening" of existing ones and foreground firms' technological innovations (Trippl et al., 2020). Thus, firms and entrepreneurs who mindfully deviate from existing practices are depicted as important change agents (Zhou et al., 2023, p. 683).

However, a perspective that illuminates the heterogeneity of firms through different types of agents is still marginal in the agency literature (Jolly et al., 2020). Contributions on regional renewal and innovation have so far ignored *"the heterogeneity of firm practice and firms' capabilities"* (Hauge et al., 2017, p. 389, Kyllingstad, 2020, p. 1). Enterprises are usually discussed under the banner of new firms (startups), incumbent firms (large, influential firms) (e.g. Jolly et al., 2020), or innovative entrepreneurs (e.g. Grillitsch, 2019). But apart from their *"capability to*

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https://doi.org/10.1016/j.peg.2024.100020
Received 21 December 2023; Received in revised form 25 June 2024; Accepted 16 August 2024
Available online 22 August 2024

generate path-breaking innovations" (Grillitsch, 2019, p. 684) and to take risks vis à vis perceived opportunities (ibid, p.685), the characteristics of these entrepreneurs are not explained. Consequently, micro-level processes and practices in firms, including their visions, strategies, or stakeholder relations remain a black box. Knowledge on these features could, however, help understand why some firms become change agents and others not. It would illuminate how enterprises are networked, whether they exert power through size or market position and where they meet limits of change agency (Eder & Döringer, 2022). One reason for this lacuna may be that empirical evidence on change agents (e.g. Eder & Döringer, 2022, p. 2, Mackinnon et al., 2019, p. 131) and qualitative studies in particular (Trippl et al., 2020, p. 196) remain rare.

Given that EEG mainly explores regional trajectories while addressing firms in a generalizing manner, it says little about firm characteristics conducive to sustainability transformation. Recent case studies on green path development mention the importance of firm actors but focus on innovation system structures and not on firms (Steinböck & Trippl, 2023; Trippl et al., 2020). Other empirical surveys take regional perspectives, leaving aside detailed enterprise descriptions (Sotarauta et al., 2021; Jakobsen et al., 2022). Considering these research gaps, the concept of transformative enterprise has been proposed to illuminate firms as agents that strive for changes toward sustainability (Hug et al., 2022; Pfriem et al., 2015; Scholl & Mewes, 2015). The concept illuminates the micro-level practices in firms. Here, we draw on the notion of transformative enterprise to complement EEG agency perspectives with a focus on firm characteristics.

Despite sustainability transformation being discussed in EEG, the discipline seldom engages with systemic changes and normative questions (Martin, 2021). The literature on green path development is mainly concerned with innovations for new green technologies (e.g., Jakobsen et al., 2022), leaving aside other enterprise types such as social innovators, who may become important in sustainability transformations (Mayer et al., 2021; Suitner, Haider, & Philipp, 2022). Moreover, green path development rests on the premise of economic growth (e.g., Donald & Gray, 2019) and draws on the concept of the "green economy", which entails decoupling material throughput from economic output through technological advances and efficiency improvements (Schulz & Bailey, 2014). But as sufficient decoupling has not happened so far (Haberl et al., 2020), we may need transformative change that encompasses systemic ecological, technological, economic, institutional, and cultural changes toward modes of living, working, and economic activity within planetary boundaries (Schneidewind, 2019, p. 11). The concept of transformative enterprise we use here takes up such systemic changes.

We examine SMEs in the wood-processing industry, which has been little noticed in economic geography. Some authors explored the wood industry through the lens of global production networks (GPN) (Gibson & Warren, 2016; Murphy & Schindler, 2011; Murphy, 2012) or applied a political ecology perspective to GPNs of timber (Gibson & Warren, 2020). Other studies on restructuring British Columbia's forest industries (Edenhoffer & Hayter, 2013; Hayter & Edenhoffer, 2016) draw on evolutionary concepts. Only lately, and with the growing popularity of bioeconomy[1] strategies, is the wood-processing industry receiving more attention. Examples are evolutionary analyses of the forest-related bioeconomy in Värmland, Sweden (Jolly et al., 2020; Martin et al., 2023) and the GIS-based study of possible pathways towards biorefining in the Canadian forest sector (Blair et al., 2017). Except for a few studies, like research on the innovativeness of Slovenian wood-processing micro-enterprises (Slavec, 2022) or incumbent pulp and paper firms in the transition to biorefining in Finland and Sweden (Hansen & Coenen, 2017), all these contributions, however, take an industry perspective, missing out the firm perspective. Consequently, SMEs are usually not discussed in detail, although they are key economic actors and may be more innovative and transformative than hitherto assumed (Slavec, 2022). The role of wood-processing SMEs in transitioning to a more sustainable economy and their practices stay underexplored.

This paper examines the characteristics and micro-level practices of wood-processing SMEs as potential change agents in sustainability transformations. It asks two questions:

- *What characteristics and micro-level practices define types of potential agents of transformative change in the wood-processing industry?*
- *What is these SMEs' capacity to exert change agency regarding sustainability transformation?*

In the next Chapter (2), we briefly present the theoretical framework, including the concept of transformative enterprise. Then, in Chapter 3, we describe the research design that encompassed firm interviews and typification. In Chapter 4, we apply the concept of transformative enterprise to our field data and empirically test it: We describe five enterprise types, their change agency, actor roles, and the limits of change agency they encounter. Our results reveal transformative firm-level agency in four types while only one type seems capable of inducing changes at the system-level. Support would be needed for SMEs to unfold their slumbering transformative potential. Chapter 5 discusses the results and concludes.

2. Agency perspective and the concept of transformative enterprise

2.1. Agency perspectives in EEG

This paper adopts an agency perspective that is suitable to examine whether and how wood-processing SMEs can become agents of change in sustainability transformation. Since a few years, change agents and different forms of agency have been increasingly discussed in EEG because structural accounts of path development did not sufficiently explain the micro-level of this process (Grillitsch & Sotarauta, 2019, p. 2). Agency perspectives highlight the role of *"knowledgeable inventors and innovators who mindfully deviate from past practices"* (Trippl et al., 2020, p. 193). In this perspective, firms are significant actors who introduce novelty by exerting change agency. Scholars thus distinguish firm-level and system-level agency. *"While firm level agency is mainly concerned with changes within a firm or organisation, system level agency is geared towards broader regional adaptations"* (Baumgartinger-Seiringer et al., 2020, p. 4). As firm-level agency can also be exerted by other actors than firms, it is sometimes called organizational-level agency (Blažek & Květoň, 2022, p. 3). Change agency is antagonistic to maintenance agency that preserves existing structures (Grillitsch & Sotarauta, 2019, p. 4). Depending on the situation, one and the same actor may exert change or maintenance agency. Together with given power relations, structural arrangements, and actors' visions, this maintaining agency defines the limits of change agency (Eder & Döringer, 2022). The latter are only recently researched, while success stories of change agency *'against all odds'* have attracted much attention (ibid., p.4). Exploring the limits of change agency is, however, essential for understanding why change is sometimes slow or absent.

Change agency is attributed to change agents, that is, individuals or groups with a crucial role in initiating, designing, and implementing change (Kristof, 2010; Wissenschaftlicher Beirat Globale Umweltveränderungen, 2011, p. 419, Kyllingstad & Rypestøl, 2019, p. 30). Firms are depicted as important change agents in regional restructuring (Morisson & Mayer, 2021) and are mainly referred to as innovative entrepreneurs (e.g., Grillitsch, 2019). Jolly et al. (2020), though, provide a more detailed account of several types of change agents: facilitating actors (e.g., universities, business organizations, or industry

[1] The EU defines bioeconomy as the production of renewable biological resources and the conversion of these resources and waste streams into higher-order products such as food, biobased products, and bioenergy (Pauli-Krafft et al., 2021, p. 47, see also European Commission, 2018)

organizations), public policy actors (e.g., municipalities or regional development agencies), fringe actors, new firms, and incumbent firms. These actor types can take different roles Sotarauta et al. (2021) described: Visionaries break away from what exists and see the big picture; support actors facilitate, coordinate, and/or provide change efforts with resources; mentors are not actively engaged in change processes but coach and advise other actors; critics ask cunning questions, forcing others to re-examine their assumptions; institutional entrepreneurs initiate divergent institutional changes and participate in their implementation; place leaders assess path development processes comprehensively and mobilize and pool resources, competencies, and powers for change; finally, innovative entrepreneurs seek new economic opportunities by taking financial and personal risks. Actor roles are not necessarily bound to one specific actor and may change over time. Relating thereto and referring to transformative change, Martin et al. (2023) highlight additional roles of firms that target transformative change with their knowledge exploitation and address societal challenges with innovation activities (ibid., p.9). Fig. 1 summarizes the types of agency, change agents, and actor roles discussed above.

Although firms and entrepreneurs appear in the mentioned categorizations of change agents, detailed accounts of these actors are missing, and micro-level practices indicating firm- and system-level agency are rarely discussed. Hence knowledge on firm characteristics conducive to sustainability transformations is sparse too. Dating from the 1990s and 2000s, anecdotal reference to firms as change agents appears in the economic geography literature: (Grotz & Braun, 1993) for example inquired firm strategies in industrial restructuring and Schulz and Soyez (2003) (see also Schulz, 2005) examined the change agency of firms offering environmental business services. More recent EEG studies generally conceive firms as Schumpeterian innovators who initiate new activities with the potential to create new growth paths (Isaksen et al., 2018, p. 4). Firm-level agency is said to unfold through activities such as introducing new technologies, market expansion, product diversification, research activities, or new business relations (Blažek & Květoň, 2022). System-level agency often targets changes in institutions (Grillitsch et al., 2022, p. 255), which can be attained through networking, lobbying, mediating, organizing events or participating in public debates (cf. Blažek & Květoň, 2022). Firm- and system-level agency may differ regarding firm size, but existing EEG studies do not differentiate between the agency of small and large firms. For operationalizing agency in an empirical case study (cf. Chapter 3), these few hints on activities indicating firm- and system-level agency are important.

EEG case studies that address sustainability transformation by examining green path development are neither more informative about firm characteristics. For instance, Trippl et al. (2020) in their research on green restructuring in regions only discuss the importance of firm-level agency and particularly firms' technological innovations. Steinböck and Trippl (2023) examine maintenance agency of firms in the Austrian bioplastics sector but do not zoom in on the firms' missions, strategies, or stakeholder relations. Other case studies on green economy initiatives in six Nordic regions (Sotarauta et al., 2021) or green restructuring in Western Norway (Jakobsen et al., 2022) take regional perspectives without discussing firm roles and characteristics in detail. With our description of enterprise types (cf. Chapter 4) we illuminate these very characteristics that eventually translate into firm-level and system-level agency. Because we think that EEG accounts of agency, which are in the vein of mainstream economics may need addition if we are to understand the role of enterprises in systemic transformations, we mobilize the concept of transformative enterprise.

2.2. Transformative enterprises: change agents in sustainability transformations

In our research, we use the concept of transformative enterprise that can complement existing conceptions of firms in EEG as it describes firms as change agents in sustainability transformations. The term transformative enterprise emerged in German-language publications on sustainable SMEs (e.g., Pfriem, 2021, Scholl & Mewes, 2015, Pfriem et al., 2015). Drawing on the review of 44 publications in this broad literature, Hug et al. (2022) developed a definition of transformative enterprises[2] that incorporates detailed descriptions of a firm's mission, strategies and stakeholder relationships and can be applied empirically:

> *"Transformative enterprises are pioneering SMEs who strive for fundamental changes towards sustainability. They have a social and/or ecological (1) driving mission and are oriented along the values of (2) stability and autonomy. Inside the enterprise, they implement these values by minimizing their (3) ecological footprint, assuming (4) social obligations, introducing (5) participatory governance structures, and offering (6) alternative products and services. The enterprise's core values define how it interacts with stakeholders: transformative enterprises put (7) people before profit, emphasize (8) regional embeddedness and act as (9) change agents. By spreading their vision and taking initiative for industry changes, they trigger or facilitate transformation processes and thereby contribute to sustainable, future-proof economic practices "(*Hug et al., 2022*, p. 11).*

This definition of an ideal-typical transformative enterprise contains nine key dimensions that resulted from summarizing enterprise characteristics mentioned in the literature. Key dimensions one to eight can be attributed to firm-level agency while key dimension nine describes activities that indicate system-level agency (see Fig. 2). Every key dimension is specified with two to five indicators. For a comprehensive description of all 30 indicators, see Hug et al. (2022). Here, we just briefly explain the key dimensions.

The first key dimension called *1 Driving mission* highlights that firms pursue alternative goals other than business growth and profit maximization: Leaders have a driving mission, are often idealistic, and emphasize being a role model. Key dimension two (*2 Stability & autonomy)* describes that stability and autonomy are essential in transformative enterprises. This can entail orientation along the value of sufficiency. Besides that, autonomy in decision-making and financial independence may be important to enterprise leaders who reflect on the limits to business growth. Another feature of transformative enterprises is key dimension *3 Ecological footprint,* which focuses on low resource use and low environmental pollution.

Key dimension *4 Social obligation* entails care for employees and special endeavors for social inclusiveness. *5 Participatory governance*, the fifth key dimension, is another strategy of transformative enterprises. Participation may include employees, customers, and other stakeholders and is fostered by flat hierarchies and transparency. Alternative ownership models and knowledge exchange with partners and even competitors can also facilitate extensive participation. Key dimension *6 Alternative products & services* specifies that transformative enterprises offer alternative products and services. Often, they operate in niche markets and produce high-quality and repairable items. They may also replace products with services and seek alternatives to technological innovations.

Transformative enterprises firmly put people before profit, which is described by key dimension *7 People before profit*. This dimension entails low wage differentials, fair prices, and profit redistribution to employees or charitable projects. Moreover, this enterprise type is often firmly embedded in the region (key dimension *8 Regional embeddedness*):

[2] To some extent, the concept of transformative enterprise summarizes concepts such as post-growth business (Hinton, 2021), degrowth company (Khmara & Kronenberg, 2018), common-good oriented company (Wiefek & Heinitz, 2018), green entrepreneur (e.g. Gibbs & O'Neill, 2014) or ecopreneur (Affolderbach & Krueger, 2017). We decided to use the concept of transformative enterprise because it stresses the transformative aspect, and its nine key dimensions are relatively easy to operationalize in interview questions.

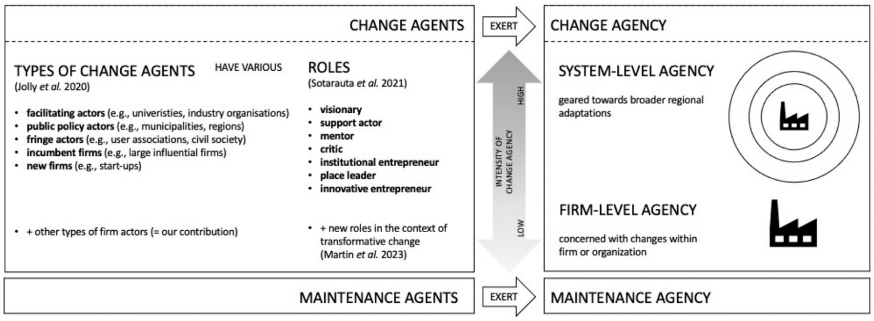

Fig. 1. Summary of agency perspectives in EEG.

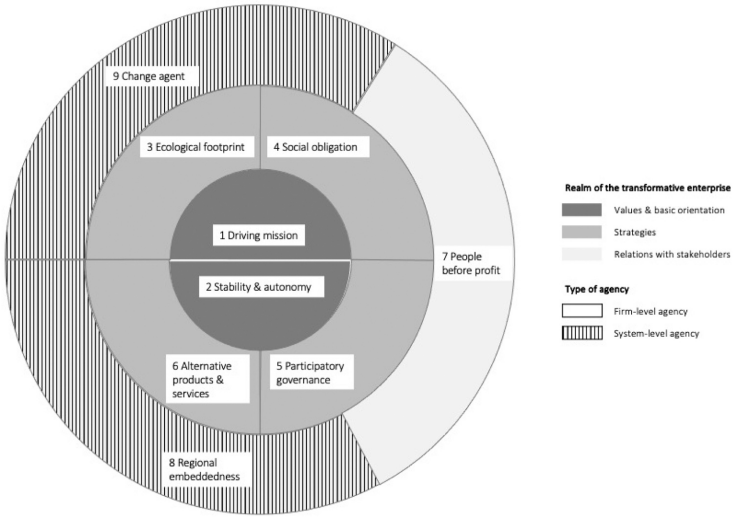

Fig. 2. Key attributes of transformative enterprises.

Whenever possible, they use raw materials from the region, employ local inhabitants, and have customers nearby. Thence, stakeholder proximity and strong cooperation are given. Finally, key dimension *9 Change agent* emphasizes that transformative enterprises act as change agents. They take the initiative for industry change and advocate for change in values.

These nine key dimensions characterize an ideal-typical transformative enterprise. We do not expect to find them all in one single enterprise. Still, this concept is useful to identify enterprise types that are potential agents of transformative change, for instance, in the wood-processing industry. We use this definition of transformative enterprises because we think that compared to other definitions (e.g., Nesterova, 2020, Khmara & Kronenberg, 2018), it is the most developed and suitable to be applied empirically.

3. Research design

3.1. Wood-processing SMEs in the Canton of Bern

Our empirical investigation focused on wood-processing SMEs[3] in the Canton of Bern, Switzerland. In this large Canton, with 30.7 % of its surface covered by forest, 2320 wood-processing enterprises employed 12,844 workers in 2016 (Lüthi, 2020, pp. 5, 13). A glance at firm sizes reveals a heterogeneous picture: Most enterprises are micro-enterprises with 1 to 9 employees (85 %), followed by small enterprises (14 %; 10 to 49 employees) and medium-sized enterprises (2 %; 50 to 249 employees). Large enterprises with over 250 employees are absent in the Canton (ibid.) but may emerge in the future through the takeover of

[3] In the Swiss context, SMEs are defined as enterprises with less than 250 employees. SMEs with 1 to 9 employees count as micro-enterprises, SMEs with 10 to 49 employees are called small enterprises and SMEs with 50 to 249 employees are defined as medium-sized (Bundesamt für Statistik, 2019).

smaller ones. Because many enterprises in the first processing stage (wood harvesting) are in public ownership, we restricted our analysis to the second and third processing stages, including sawmills and planing mills, timber constructors, carpenters and roofers, joineries, and woodware manufacturers.

The SMEs we examined may promote sustainability transformation: Wood is among Switzerland's important renewable resources (Pauli-Krafft et al., 2021) and ascribed high potential to promote decarbonization and climate change mitigation (Taverna, Hofer, Werner, Kaufmann, & Thürig, 2007). The Swiss Resource Policy on Wood 2030 (Ressourcenpolitik Holz 2030) particularly emphasizes timber construction because it stores carbon and can replace the CO_2-intense concrete (Pauli-Krafft et al., 2021, p. 42). Although Switzerland does not have a bioeconomy strategy, converting wood into fuels, energy, and new materials is considered an important future industry development (ibid.). This resonates with European bioeconomy policies where the forest industry is ascribed high potential to contribute to a fossil-free society (European Commission, 2018). Indeed, with its renewable resource that has the potential to replace polluting materials such as concrete and plastics, the wood-processing industry is pivotal for a future bioeconomy (Studer & Poldervaart, 2017).

At the same time, wood-processing SMEs operate in a challenging economic environment. Costs for industrial areas, energy, transport, and labor are high in Switzerland (Lehner et al., 2014, p. 37). And as droughts, storms, pest infestations, and forest fires have intensified over the last years (Bundesamt Für Umwelt, 2022, pp. 17–18), unexpected spikes and slumps in wood supply with resulting price volatility have become frequent. Also, enterprises need to adapt to the processing of hardwood because domestic softwood trees are heat-sensitive and may be replaced in the future (Lehner et al., 2014, p. 237). However, the Swiss wood-processing industry may be labelled traditionalist and is slow in industrial restructuring. Unless in other European countries, large-scale industrialization has not taken place after World War II. This makes SMEs often less internationally competitive: The industry, and the first two production stages (wood harvesting and sawing) in particular, saw stagnating production values and value-added in the last 20 years (Bundesamt Für Umwelt, 2022, p. 88). Many small sawmills that cannot profit from economies of scale had to abandon business (Lüthi, 2020). Moreover, two big processors of industrial timber (paper mill, producer of particle boards) recently closed their plants, which left the country with an interrupted value chain (Pauli-Krafft et al., 2021, p. 14). Therefore, and because up to one fifth of harvested wood is directly exported, value-added gets lost (ibid.). To meet these challenges, the wood-processing industry needs adaptation and change. Strengthening efforts to develop a wood-based bioeconomy in Switzerland[4] while being sensitive to the structure and challenges of the national industry will be key in industry transformation.

Despite the challenges, some industry features may also be favorable for transformative enterprises which could advance this transformation in a sustainable direction. As the industry relies on a renewable resource, the prerequisites for ecological sustainability are good. Moreover, the industry structure with mostly small and family-owned SMEs that are rooted in rural areas may favor social engagement and cohesion within enterprises and beyond. At the same time, this structure can become challenging for initiating changes outside the firm: to get power and influence small players need to network and cooperate. Besides, with the absence of large firms, the industry lacks a strong political lobby.

[4] Switzerland does not have a bioeconomy strategy but various political strategies tackling sustainable development and the reduction of oil dependency. In 2017 the national research program on the resource wood (Nationales Forschungsprogramm NFP66 Ressource Holz) proposed to implement a strategy for the wood-based bioeconomy that would include consistent cascade use of the resource, e.g. through extending existing plants and high domestic value added with wood (Studer & Poldervaart, 2017, p. 46 f.). Up to date there is no such strategy.

3.2. Data and methods

In the beginning of our qualitative field research, we faced the challenge of finding possibly transformative SMEs. Since there is no firm list of potentially transformative SMEs in the wood-processing industry, we decided to create a firm inventory in a first step. During four interviews with industry experts, we received information on pioneering and well-known innovative firms. Using the snowballing principle and through additional desktop research, lists of professional associations, and statistical information, we collected data on 86 wood-processing SMEs. Inventory data covered the following categories: products and services, legal form, founding year, firm history, family enterprise, number of employees, vision or mission statement, sustainability, sustainability report, labels and certificates, circular economy, membership in professional associations, awards, and coverage in the media. To prioritize SMEs for interviews, we used ad-hoc selection criteria from the literature on transformative enterprises that were applicable to the information in the inventory (cf. Fig. 3). We then sorted SMEs into low, medium, and high priority and contacted SMEs with a high priority score.

In a second step, we conducted semi-structured interviews with 24 wood-processing SMEs between March and September 2021. Interviewees included sawmills and planing mills, timber constructors, carpenters and roofers, joineries, and woodware manufacturers. Table 1 presents an overview of interviewed SMEs. Note that the distribution of enterprise sizes is not representative for the industry. Despite restrictions due to COVID-19, we were able to hold all interviews on-site, and in all but one case, we spoke to the owner. Interviews lasted one hour on average. We recorded interviews and used MAXQDA for transcription and analysis. For the analysis, we applied qualitative content analysis drawing on Mayring and Fenzl (2019, p. 640). Through deductive coding, we assigned text to the nine key dimensions of transformative enterprises (cf. Chapter 2.2). Inductive coding served to build new categories that emerged from the transcript, for example on SMEs' change agency and the challenges they face.

After coding all the material, we started typification of interviewed SMEs. Typification is the process where, based on similarities in selected characteristics, objects are grouped into types (Kuckartz, 2010; Kluge, 2000). The objects of the same type should be as similar as possible, while the different types should be as dissimilar as possible (Kuckartz, 2010, p. 555). As the selection of cases is often not guided by the criterion of representativity in qualitative research, some types may be based on a small number of cases (ibid. p.561). Typification is a qualitative generalization strategy and an analytical tool that provides orientation within the data. Unlike quantitative cluster analysis, it can be applied to small samples but still allows future projections and the formulation of type-specific policy recommendations (Kuckartz, 2010, pp. 556 & 565).

Two phases defined our typification: Based on our code system that contained the nine key dimensions of transformative enterprises, we first grouped similar SMEs. To do so, we used the MAXQDAs code-matrix-browser, which depicts the frequency of codes in interviews. Five empirical SME types emerged from this process. Second, we wrote synthetic descriptions of each type. In these descriptions we also assessed the transformative potential and change agency of SME types: We specified to what extent SME types fulfilled each of the nine key dimensions (cf. Chapter 2.2) we had coded. Then, we evaluated their change agency. To do so, we referred to the literature, i.e. to enterprise strategies indicating firm-level agency and to networking activities, engagement in (industry) associations etc. representing system-level agency (cf. Chapter 2.1). Besides, the operationalization of key dimension nine of transformative enterprises (cf. Chapter 2.2) describing how SMEs initiate changes with the questions "does your enterprise engage for changes in the industry (e.g. in industry associations, networks

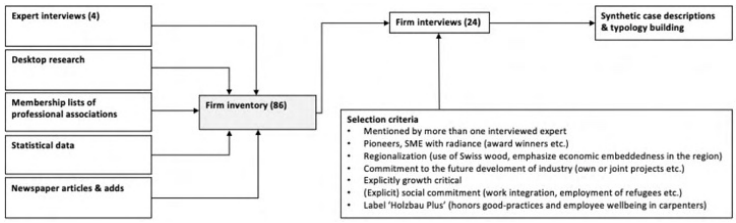

Fig. 3. The selection process for interviewed SMEs in the Canton of Bern.

Table 1
Overview of 24 interviewed SMEs.

Interview Nb.	Industry branch	Interview partner (s)	Length of interview	Legal form	Family enterprise (Y/N)	Size category (employees)
2	Sawmill & planing mill	owner	1 h	PLC	Y	1 to 10
7		co-owners (2)	1 h	PLC	Y	51 to 70
9		co-owner	50 min	PLC	Y	11 to 30
11		owner	1 h 30 min	PLC	Y	1 to 10
12		co-owner	50 min	PLC	Y	11 to 30
13		owner	1 h 10 min	PLC	Y	1 to 10
24		owner	1 h	PLC	Y	1 to 10
14	Joinery	co-owner	1 h	PLC	Y	> 70
16		owner	50 min	Ltd	N	1 to 10
19		owner	1 h 10 min	PLC	Y	31 to 50
21		member of administration	2 h	PLC	Y	> 70
1	Timber constructor, carpenter, roofer	owner	1 h 15 min	PLC	N	11 to 30
3		owner	1 h	PLC	Y	51 to 70
4		owner	1 h 30 min	PLC	Y	> 70
5		owner	1 h 5 min	PLC	N	11 to 30
17		owner	50 min	PLC	Y	> 70
18		owner	1 h 10 min	PLC	Y	31 to 50
20		co-owners (3)	1 h	Ltd	N	1 to 10
23		owner	1 h 5 min	Individual company	Y	1 to 10
6	Woodware manufacturer	co-owner	1 h 40 min	PLC	Y	11 to 30
8		co-owner	40 min	PLC	Y	11 to 30
10		owner	1 h	PLC	N	11 to 30
15		owner	1 h	Ltd	Y	1 to 10
22		owner	1 h 30 min	PLC	Y	1 to 10

etc.)?", "as an entrepreneur, can you initiate changes in the industry?" and "how do you estimate your scope of action in this regard?" gave us hints about SMEs change agency. Ultimately, we named the types and re-checked whether the interviewed SMEs fit into the types.

4. Five types of potentially transformative enterprises and their (limits of) change agency

Drawing on the nine key dimensions of transformative enterprises (cf. Chapter 2.2) and their expression in the 24 enterprises investigated, we identified five enterprise types: silent ecologists, social pioneers, visionary nonconformists, ambitious entrepreneurs, and pragmatist traditionalists. Fig. 4 shows the incidence of SME types in our sample. Note that the incidence of types is not representative for the whole industry and that qualitative types may be based on a small number of cases.

None of the five enterprise types fulfills all nine key dimensions and can be called fully transformative. Nevertheless, the general characteristics of interviewed SMEs depict a comparatively sustainable industry: We met passionate entrepreneurs who were emotionally attached to the resource wood they work with, their family enterprise, and their community. Employee wellbeing was of great importance in these SMEs, many showed strong social commitment, and all seemed to put people before profit. The latter fact and limited personal or spatial resources

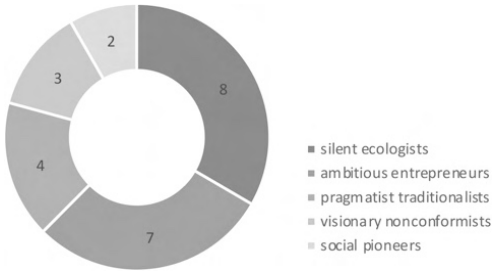

Fig. 4. Incidence of enterprise types in our sample of 24 SMEs.

were undoubtedly reasons why most enterprise types did not pursue a growth strategy. From an ecological point of view, and not unexpectedly, we found that most SMEs were relatively "green" as they use a renewable resource that, in many cases, grows near the production site, and production processes have little adverse environmental impacts. Besides, interviewees emphasized that the quality and durability of their products had priority.

Even though we did not find an ideal-typical transformative

enterprise, all types but the pragmatist traditionalists show characteristics that could point toward transformative change. In what follows, we describe each enterprise type by referring to the nine key dimensions of transformative enterprises. By following these key dimensions, we also differentiate between activities targeting the firm-level (key dimensions one to eight) and characteristics that may indicate system-level agency (key dimension 9) Figs. 5–9. Figures five to nine highlight important key dimensions in each enterprise type. Chapter 4.6 presents the limits of change agency. In Chapter 4.6 and the corresponding Table 2, we summarize enterprise types along the key dimensions of transformative enterprises and recapitulate types of change agency and actor roles.

4.1. Silent ecologists

In the enterprise category we call silent ecologists, family-owned micro-SMEs with one to 10 employees are predominant. Five out of eight silent ecologists were sawmills that process regional wood from within 25 to 30 kilometers. These attributes affect values and basic orientation: Many SMEs show a strong long-term orientation and want to hand over their business to the next generation: *"Our goal is to hand over a healthy business to the next generation"*, said I6. Therefore, business growth is not the primary objective of these SMEs. I13 told us that they *"… try to generate money for replacement investments to guarantee our long-term existence. But we do not pursue a shareholder-value approach … the continued existence is what counts"*. Three interviewees stated what interviewee I23 put as follows: *"We do not want to become a larger enterprise"*. Others mentioned that personal resources, administrative burdens, availability of land, and tight space conditions limit business growth. It is also feared that growth could compromise quality and that the market is saturated. These SMEs instead want to preserve what has proved successful.

Firm-level agency of silent ecologists unfolds in the survival strategies they pursue: Interviewees pointed out that they operate in niche markets, for example for massive wood products, small product series, or historical preservation. They also try to lower costs by minimizing transports and resource use. Other environmental measures like exploiting byproducts (e.g., sawdust) and solar systems for energy production, the use of electric vehicles, or abandoning the use of toxic substances (e.g., wood preservers, lacquering) resonate with personal values of SME owners. Moreover, silent ecologists often treat their employees – whom they consider their most important asset – as family members. Relations with stakeholders are influenced by these SMEs' local anchoring: Besides using regional wood resources, they serve customers in the region and find their employees within some kilometers of the production site. These SMEs also intensely cooperate with other businesses in the region but have little network ties to other institutions than firms or regions.

Even though silent ecologists use many strategies of transformative enterprises, their system-level agency seems limited: Entrepreneurs of this type do not consider themselves empowered to induce change at the industry level but point to the hindrances small SMEs encounter like their limited power, financial capital and time to engage in networking or lobbying activities. Hence, they find themselves in the role of silent change makers. In conclusion, silent ecologists have been ecologically and socially sustainable for a long time but do not promote this aspect because it is deeply rooted in their business philosophy or mission.

4.2. Social pioneers

Among the enterprises we named social pioneers, we find two small SMEs with 11 to 50 employees in our sample. Social values are essential drivers for the enterprises' leaders who engage for the integration of disabled or delinquent people into the labor market. In the eyes of I18, *"…at some point, our social system will not be financeable anymore. And I think we as entrepreneurs are obliged to contribute here"*. Social pioneers are moreover long-term oriented: *"I am the fourth generation, and I want to think in generations too"*, said I18. This means that business growth is not a strategic goal, and financial independence (i.e., own financial resources for investments) is valued.

The firm-level agency of social pioneers reflects in enterprise strategies and relations with stakeholders. Environmental protection and low resource consumption are important to these SMEs and are for instance attained through resource-saving building systems, energy generation from byproducts or solar panels, the use of Swiss wood and short transportation distances. Moreover, responsibility towards employees is a major concern in social pioneers. I10 said: *"…if someone has a problem, we sit down and drink coffee together. And if it is a larger problem, I sit down with him or her in the evening, and we drink beers and talk"*. This

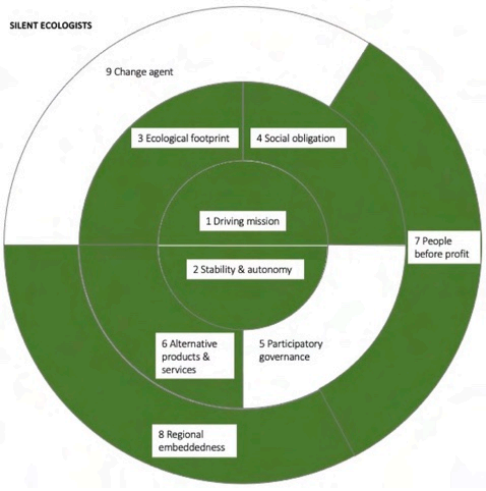

Fig. 5. Prominent key dimensions in silent ecologists (green color).

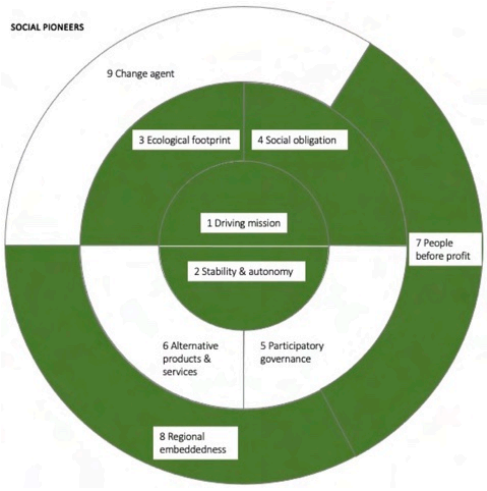

Fig. 6. Prominent key dimensions in social pioneers (green color).

social orientation influences the relations with stakeholders: SMEs are deeply rooted in the region, which includes close and stable contact with suppliers. They not only use regional resources but also emphasize regional value creation, support other SMEs in the region, and engage in communal projects. *"If we support each other in the region, everyone is helped."*, said I10.

Although these entrepreneurs do not consider themselves as critical change agents and point to the relative powerlessness of small SMEs, they agree that one may initiate small changes in small steps. To get things moving, social pioneers exert system-level agency for example by investing in apprentice training or experience groups. I10 described that he engages for the use of regional wood *"…by talking to people and making them aware that buying regional wood is not a bad idea"*. Therefore, social pioneers are sometimes silent change makers and sometimes act as social visionaries who bring about minor changes. To sum up, social pioneers firmly put people before profit and are important employers for disadvantaged people in the regions. These SMEs' social orientation includes the wish to give back something to the places where they operate. Hence using regional resources and creating regional value is important to them.

4.3. Visionary nonconformists

In our sample, the three SMEs we call visionary nonconformists are small too (one to 30 employees) and include newly founded enterprises. Personal values strongly influence these SMEs' vision of good business practices and have been an important reason for starting a business. I16, for example, said: *"I have certain values in my life, and these should reflect in my business […]. It is about respect for nature, respect for every living being"*. Such values reflect in business strategies and firm-level agency: In one SME that made working conditions more compatible with family and care work, all three workers were owners, had the same salary, and worked part-time. These owners said that in their enterprise, they wanted to reconcile *"…the joy of work with our unpaid work. We have children and family. And our enterprise allows us many freedoms in that respect"* (I20). Another enterprise was driven by a marked sufficiency orientation and consequently followed a no-growth strategy: *"I follow a no-growth strategy […] this gives me the freedom not to be suspectable to blackmail, we do not need external financing, and I can completely rely on my employees"*, said I1. A third enterprise in this group also emphasized elements of sufficiency, such as deceleration and decommercialization. These fit well with its aim to be a "just normal" working place for any staff.

Other aspects of firm-level agency in visionary nonconformists are that despite their different visions, all interviewed SMEs offered alternative products and services in niche markets, like help for do-it-yourself construction or beekeeping products. Such business strategies engender close contact with stakeholders and regional rootedness as employers. However, as visionary nonconformists are outsiders with their ideas, their cooperation with other wood-processing SMEs is less pronounced. For the same reason, SMEs in this category instead try to change things with or in their own business and do not get involved in tasks at the industry-level.

Visionary nonconformists are therefore little networked with powerful players in the industry, and their system-level agency seems minor. They consider themselves too small, and industry associations too slow and conservative to make a difference. However, with their visions they target larger societal changes and may become more powerful once they join with like-minded people. Visionary nonconformists' role includes being economic, ecological, or social visionaries and critics. To conclude, visionary nonconformists founded their businesses to do things differently. But although they are driven by strong values, their engagement for value change may not (yet) transcend the boundaries of the enterprise.

Fig. 7. Prominent key dimensions in visionary nonconformists (green color).

4.4. Ambitious entrepreneurs

Among the seven enterprises of our sample which we call ambitious entrepreneurs, we find slightly larger SMEs (31 to over 70 employees) that seek new market niches and promote technological innovations. Strong ecological or social values are not the main motivation for the owners but are pursued if these align with a promising business case like, for example, timber frame construction. I21 summarizes this spirit as *"we always try to be as different as possible from everyone else"*.

Business strategies that translate into firm-level agency reflect the fact that these SMEs want to be frontrunners in new products and technologies: With their products, ambitious entrepreneurs serve niche markets but aim to become market leaders. They also try to be attractive employers for skilled workers and are open towards business growth or

Fig. 8. Prominent key dimensions in ambitious entrepreneurs (green color).

actively pursue a growth strategy. I21 mentioned that *"…there is nothing that precludes growth, except perhaps the size of our production site … But growth is definitely a topic for us"*. Following the argument of Haberl et al. (2020), such a growth strategy may, however, increase environmental damage. In addition to the strategic goal, enterprise growth is driven by market competition, investments into new technologies, infrastructure, and product development. The desire to become market leaders makes that collaboration outside the industry, including research, is a central pillar of the enterprises' relations with stakeholders. In I4s enterprise, they *"…often collaborate with [primary, secondary and vocational] schools. We always have interns … We also often have schools visiting our production site. We are very well networked in this regard"*, the owner told us. Relations with suppliers, on the other hand, are often less tight and regionalized than, for example, with silent ecologists. However, customer proximity remains an important pillar of business activity in niche markets.

The intense collaborations ambitious entrepreneurs maintain can also foster system-level agency. Equally do networking activities beyond the borders of the industry SMEs of this type undertake to promote their ideas and products. I4 said: *"It [our network] covers the state, the cantons, schools and is also cross-border. And if you are in this network for some time, you have advantage knowledge so that you can initiate changes"*. Ambitious entrepreneurs moreover engage in industry associations and are rather confident that they can initiate changes in the broader industrial context. Their size and economic competitiveness may support system-level agency additionally. Hence, these enterprises have the role of innovative entrepreneurs and technological visionaries. In summary, ambitious entrepreneurs initiate new products and services and want to become market leaders with their innovations. Ecological and social considerations are significant to them but may be compromised by competition and growth dynamics. These SMEs emphasize the importance of large networks and consider themselves empowered to initiate changes at the industry-level.

4.5. Pragmatist traditionalists

The last enterprise category we identified, the pragmatist traditionalists, encompasses four small to medium-sized family-owned SMEs (11 to over 70 employees) in our sample. Traditional values and the wish to survive in the long run are pronounced in this SME category, as I14 said: *"We somehow need to do business and to make money. We do not want to survive short term but in the long run"*. In contrast to ambitious entrepreneurs, pragmatist traditionalists are occupied with daily business and have less energy to initiate novelty: *"We do what we have done ever since […] rather than thinking about what else we could do, what other direction we could take. This is why I say [we are] traditional"*, mentioned I5.

Regarding enterprise strategies, pragmatist traditionalists try to survive in the mainstream market. Hence features of firm-level agency like market expansion, technological investments and product diversification are pronounced in this type. In such a market environment, SMEs face increased competition and pressures to grow and innovate. Therefore, they may sideline pronounced ecological or social goals. I5 for example said that demand and competition were steering the growth of his enterprise and that they did *"…not push this [the reduction of harmful environmental impacts or pollution] in particular"*. Although some SMEs in this category serve international markets, their relations with stakeholders are still rooted in the regions. They usually find their employees in the regions and – in line with their traditionalist orientation – want to keep value-added and jobs in the region. This goes along with close contact with suppliers. When it comes to the provenance of wood, they are, however, less strict and put price before belief. Pragmatist-traditionalists wish to serve the regional labor market, meaning that many invest in apprentice training.

SMEs of this type exert some degree of system-level agency as they actively participate in industry associations and have a favorable view of their ability to bring up topics or even change small things at the industry-level. Relating thereto, I7 meant that *"…the more you are, the more power you have [to initiate changes]"*. But as these changes seem to aim at pragmatic improvements in daily business, we ascribe the role of status quo keepers to pragmatist traditionalists. To conclude, entrepreneurs in this category are too occupied with daily business and surviving in the mainstream market to bring up novel ideas. Besides investment in apprentices, they are not committed to a strong vision or desire to initiate fundamental changes. Although pragmatist-traditionalist SMEs are important employers in the regions, they seem to be keepers of the status quo.

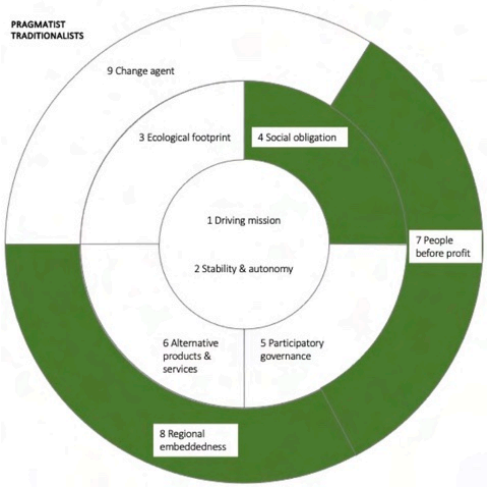

Fig. 9. Prominent key dimensions in pragmatist traditionalists (green color).

4.6. Limits of change agency

After this in-depth discussion of enterprise types, we now turn to the question of limits of change agency. These should be considered it we are to take the heterogeneity of firms as change agents seriously. In our study, key dimensions of transformative enterprises were particularly pronounced in silent ecologists, social pioneers, and visionary non-conformists represented by small and micro-SMEs. At the same time, these small SMEs meet special challenges. Specifically, very small enterprises pointed to their limited power and influence at the system-level while we saw similar issues for all SMEs at the firm-level. The micro-perspective on SMEs we took in this study allowed us to uncover these challenges and contradictions which illustrate the limits of change agency: Overall, there are few incentives to become more sustainable. From an economic point of view, there are perverse incentives to be part of an unsustainable economy based on high resource use and growth. Accordingly, one-third of interviewees mentioned discrepancies between ideals and economic reality. I19 (ambitious entrepreneur) vividly summarized the dilemma:

> *"…from an ecological point of view, I feel that one should turn off all machines tomorrow, lock the doors, and stop business altogether … We use resources. Of course, it is wood and not concrete; it is renewable, which is a big advantage. But we are a small wheel in the great economic machinery that uses resources and makes that our planet is already used up by the middle of the year." (I19)*

Further, in the present economic context, enterprises are exposed to competition. They must innovate, invest in new machinery, and

generate orders, which can compromise ecological goals and personal visions. I1, a visionary nonconformist, emphasized that *"[one needs] orders, somehow, to make money. There, you cannot always choose."* And added, *"…sometimes we still construct single-family homes. And I think that single-family homes are not the right answer to the questions of our time. This is sometimes challenging for me"*. Likewise, because businesses need to be profitable, many SMEs expand their range of activity beyond the region and buy cheaper material from abroad, although this goes along with higher emissions from transport. The pressure to grow is another challenge for entrepreneurs, especially if they belong to the 15 interviewees who said they are satisfied with their enterprise size. Growth drivers are manifold and include price pressure, high demand for certain products, financing models (e.g. loans), and investments and innovations. A silent ecologist, for example, said:

> *"…somehow, we need a certain amount of growth. Now, for example, we have a new machine that allows us to bundle slats almost automatically, only with one worker involved. This costs a lot of money, which means that we must produce more slats in turn … Yes, we need a certain amount of growth to pay back investments"*. (I2).

Eight interviewees moreover mentioned that price setting often makes more expensive, sustainable products or services less demanded, and customers ask for cheaper, unsustainable options: *"If customers wish American walnut, one buys this wood from the timber merchant and processes it"*, says I7 (pragmatist traditionalist). Also, new products are often not significantly more expensive than repair work.

Regarding ecological challenges, four SME owners pointed out that environmentally friendly solutions are often costly. The silent ecologist I2 told us that *"…we cannot, just when we are inclined to, change to electric drive […]. This is too costly; we cannot generate that amount of money within a short time"*. What is more, for some products, such as wood preservatives or glued timber, ecological alternatives are difficult to implement or not available. Finally, regarding social challenges, three interviewees emphasized that social engagement, like integrating disabled people into the labor market, is time-intensive and therefore often too costly. Besides that, sheltered workshops sometimes produce similar products but are much less exposed to economic competition. I6, another silent ecologist, said: *"They [the sheltered workshops] are sometimes our competitors because relying on public money they can calculate differently"* and added that"*… in our enterprise, we must do things three times faster to get the same price"*.

These economic, ecological, and social challenges are particularly emphasized by micro- and small SMEs that fit into the types of silent ecologists, social pioneers, and visionary nonconformists. In these enterprises, workload is high and family members may help running the enterprise beyond retirement age. I10 for example said: *"…I do not have time for everything … I cannot pay a substitute, also I cannot go on a holiday for 14 days"*. And I13 added that his father was *"…78 years old and comes to work daily"*. Micro- and small SMEs moreover mention power-related obstacles, namely that they have little power and that initiating changes needs time and financial capital. I6 told us that he could not change procurement practices because *"…the large ones already had low-price offers and were not interested … if the large ones do not help, it does not work"*. Also, these enterprise types are skeptical about their capacity to influence industry associations (system-level agency), which they often judge as inertial and conservative. Larger and established SMEs that engage in industry associations (i.e. ambitious entrepreneurs), on the contrary, see fewer limits to their change agency.

4.7. Summary of change agency and actor roles in enterprise types

The enterprise types we present may be seen on a spectrum from change to maintenance agency (see Fig. 10). To become influential change agents with a transformative impact, SMEs need to exert change agency beyond the firm, that is, system-level agency. However, among the five enterprise types, only ambitious entrepreneurs seem to exert meaningful system-level agency: They are confident that they can initiate changes through their large networks and engagement in industry associations. For silent ecologists, social pioneers, and visionary nonconformists, change agency does not transcend the boundaries of the enterprise. They all point to the powerlessness of small SMEs and instead try to change things in their own business (firm-level agency). Finally, pragmatist traditionalists may cooperate with industry associations for improvements in daily business but do not come up with novel ideas. Thus, they seem to contribute to maintaining the status quo and exert maintenance agency.

Depending on their agency, SME types can take various and sometimes more than one actor role. Of the roles introduced in chapter 2 (cf. Sotarauta et al., 2021), we identified innovative entrepreneurs, visionaries, and critics in our sample: Ambitious entrepreneurs promote new technologies and innovations and are therefore in the role of innovative entrepreneurs and technological visionaries. Visionary nonconformists and social pioneers are driven by a strong vision and thus also take the role of visionaries. With their critical attitude toward industry associations, visionary nonconformists are moreover critics. Besides these three

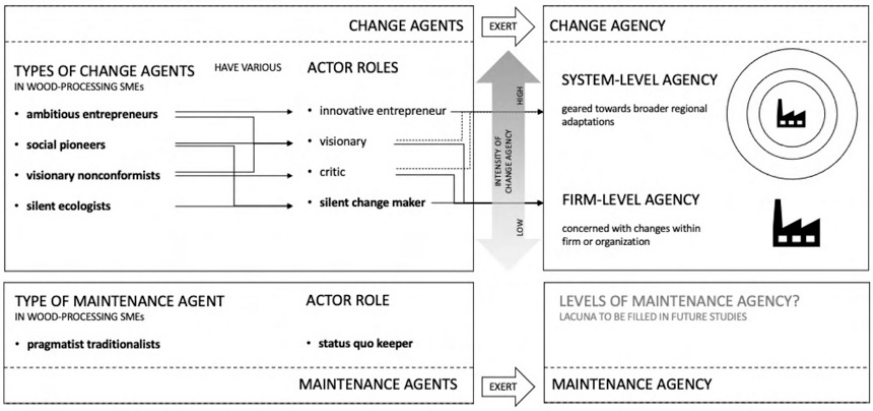

Fig. 10. Our contribution to the agency perspective: Five types of agents in SMEs and their actor roles.

roles, and in line with Martin et al. (2023), we observe that SMEs take additional roles in the context of transformative change: Innovation activities of ambitious entrepreneurs target societal challenges and transformative change. In our cases, we moreover find the role of silent change maker and status quo keeper. Silent ecologists and social pioneers are silent change makers: They run their enterprises in line with many characteristics of transformative enterprises but do not advertise their ecological or social sustainability. Pragmatist traditionalists who do not introduce changes finally take the role of status quo keepers (see summary in Fig. 10).

In closing, we want to recapitulate how transformative the identified SME types are: Silent ecologists, social pioneers, and visionary nonconformists are all driven by a strong mission and fulfill most key dimensions of transformative enterprises, which makes them potential bearers of sustainability transformation. Ambitious entrepreneurs may promote transformation too, even though their growth strategy could compromise ecological or social goals. Under the given institutional and economic circumstances, this enterprise type may, however, have the greatest potential to make changes happen beyond the firm-level. Pragmatist traditionalists are not predestined to induce transformative change. Table 2 summarizes the enterprise types, their agency and actor roles.

5. Discussion and conclusion

We raised two research questions, which we explored through interview data of 24 wood-processing SMEs. Departing from the assumption that SMEs can become bearers of transformative change, and based on our definition of transformative enterprises, we first sought to find potential agents of transformative change among wood-processing SMEs. Second, we investigated these SMEs' capacity to exert change agency regarding sustainability transformation. To generalize the qualitative data, we used typification and identified five enterprise types among 24 interviewees: silent ecologists, social pioneers, visionary nonconformists, ambitious entrepreneurs, and pragmatist traditionalists. However, these SMEs had restricted agency regarding sustainability transformation: their transformative activities had too little radiance, and barriers to change were too high at the industry level. Hence, we did not find fully transformative enterprises but saw that silent ecologists, social pioneers, visionary nonconformists, and ambitious entrepreneurs have the potential to become transformative. We described their roles as silent change makers, visionaries, critics, and innovative entrepreneurs. The SME type called pragmatist traditionalists did not engage for transformation and are thus status quo keepers.

Our findings advance the EEG literature and agency perspectives threefold: First, we illuminated the heterogeneity of firms as change agents through a detailed typification of SMEs. This complements existing accounts of actors' roles and their change agency in regional restructuring. Second, by showing the obstacles SMEs meet, we added to the few studies examining the limits of change agency. And third, we contributed to studies in EEG, that recently started addressing transformative industrial change. These three contributions are as follows:

Regarding the heterogeneity of firms as change agents, we examined and typified firm actors that have hitherto only been discussed in a generalizing manner in the path development literature. Case studies mobilizing the concept of agency usually have industry perspectives and draw on large, influential firms (e.g., Miörner, 2022, Baumgartinger-Seiringer et al., 2020, Jolly et al., 2020, Martin et al., 2023). Our findings indicate that sustainability transformation in SMEs can have many faces: Not only the "usual suspects" (i.e., well-known, successful

Table 2
Summary of enterprise types.

	enterprise type	silent ecologists	social pioneers	visionary nonconformists	ambitious entrepreneurs	pragmatist traditionalists
general characteristics	**number of employees**	micro to small SMEs (1 to 10 EMPL in sample)	medium-sized SMEs (11 to 50 EMPL in sample)	micro to medium-sized SMEs (1 to 30 EMPL in sample)	medium-sized to large SMEs (31 to >70 EMPL in sample)	small to large SMEs (11to >70 EMPL in sample)
	ownership	mostly family businesses	not necessarily family business	newly founded business	not necessarily family business	mostly family businesses
	industry branch	sawmill / planing mill (predominantly); carpenter; woodware manufacturer	carpenter; woodware manufacturer	carpenter; joinery	carpenter; joinery	sawmill / planing mill; carpenter; joinery; woodware manufacturer
key dimension of transformative enterprise (green = particularly pronounced)	**driving mission**	strong ecological values underpin business	strong social values underpin business	social, (alternative) economic, or ecological motivation for starting a business	pursue the most promising business case	pragmatist entrepreneurs, "just do their business"
	stability & autonomy	Stability-oriented; keep family business in the long run; not growth-oriented	importance of financial autonomy	sufficiency orientation; may follow a no-growth strategy	growth-oriented take financial risks	enhanced growth pressures because of (international) competition
	ecological footprint	high awareness of business' environmental impact; raw material from the region	high awareness of business' environmental impact; raw material from the region	high awareness of business' environmental impact	taken seriously but sometimes compromised by growth strategy	not a key concern
	social obligation	employees treated as family members	employee wellbeing; integration of disabled, delinquent, or unemployed	employee wellbeing; compatibility of paid work and care work; integration of disabled	importance of employee wellbeing to keep and attract scarce skilled workers	employees treated as family members
	participatory governance	traditional governance structures	traditional governance structures	alternative ownership models & hierarchies	try to break with outdated hierarchical governance structures	traditional governance structures
	alternative products & services	niche markets	niche markets and others	niche markets	niche markets with growth potential	mainstream markets
	people before profit	good relations with employees and other stakeholders are key	good relations with employees and other stakeholders are key	good relations with employees and other stakeholders are key	good relations with employees and other stakeholders are key; transparency of value chain not always given	good relations with employees and other stakeholders are key; transparency of value chain not always given
	regional embeddedness	almost all stakeholders in region	almost all stakeholders in region; engagement in local community	less reg. embedded because SMEs are "outsiders" with ideas	engagement in local community	mainly concerning employees
	change agent	restrict changes to own enterprise	restrict changes to own enterprise; perceive themselves as too small to initiate industry-level changes	engagement for value change does not (yet) transcend boundaries of enterprise	perceived as change agents at the industry-level	no significant engagement for change
agency	**maintenance (light) vs. change (dark)**					
	firm-level (light) vs. system-level (dark)					
actor role		silent change maker	silent change maker; visionary (social)	visionary (economic, ecological, social); critic	innovative entrepreneur; visionary (technological)	status quo keeper

pioneers) may promote sustainability transformation, but little-recognized SMEs like the silent ecologist, the social pioneers, or the visionary nonconformists. Besides that, our research confirms findings others have made: The transformative potential we detected in ambitious entrepreneurs supports Baumgartinger-Seiringer's (2022) claim that powerful incumbent firms are not necessarily maintenance agents. Our findings also align with Slavec (2022, p. 15), who finds that wood-processing micro-enterprises can be quite innovative. Besides, we discovered the actor roles of visionaries, critics, and innovative entrepreneurs described by Sotarauta et al. (2021) in their study on green path development. Alike Martin et al. (2023), we moreover found that in the context of transformative change, actors take additional roles: SMEs aiming at a small ecological footprint and social inclusiveness without promoting this aspect or being recognized as change agents take the role of silent change makers. And those SMEs who exert maintenance agency by adhering to existing structures are status quo keepers. Overall, this shows that SME types and roles in industrial restructuring may be more diverse than hitherto assumed.

Our study adds knowledge to the few accounts describing the limits of change agency. We found that the change agency of the SMEs we interviewed is restricted and showed their economic, ecological, social, and organizational challenges. Existing case studies examining limits of change agency take a broader, regional perspective and treat other topics: They consider actors involved in establishing a university campus (Eder & Döringer, 2022) or managing economic change in coal-dependent areas (Weller & Beer, 2022). Nevertheless, the limits of change agency we observed are similar to those mentioned by Eder and Döringer (2022): Like the contradiction between vision and economic reality we saw in many SMEs, Eder and Döringer (2022, p.13–15) find that diverging visions and unfavorable structural preconditions can prevent change. Moreover, power-related limits of change agency, such as scattered power resources, which Eder and Döringer (2022) describe, resonate with the powerlessness of small SMEs we identified, or the inertia of established industry associations SMEs face. The importance of firm size and networks for becoming influential, that has also been discussed from other conceptual angles (e.g., Gibbs & O'Neill, 2014), is a topic all through our interviews.

By addressing sustainability transformation, we also contribute to the literature on transformative industrial change that is critical of traditional notions of innovation. In line with Martins' plea to rethink regional studies, which involves rethinking research priorities, theories, and empirical foci (Martin, 2021, p. 151), we decided to examine "just normal" SMEs and their potential to become change agents in fundamental shifts towards sustainability. This provides a counterbalance to a body of literature that has so far centered on successful regions and cities (ibid., p.153) and emphasized the role of large technologically innovative firms in regional development. Moreover, by using the concept of transformative enterprise, we pave the way for discussing previously neglected normative questions in our discipline (Donald & Gray, 2019; Martin, 2021; Schulz & Bailey, 2014). With the concept of transformative enterprise, we highlight characteristics of firms other than technological innovativeness that could help address grand societal challenges. Such knowledge could inform efforts to redesign regional innovation policies such as mission-oriented, challenge-oriented, or transformative innovation policies (Mazzucato, 2018; Tödtling et al., 2021; Schot & Steinmueller, 2018). Our research adds to the disciplines' reorientation towards environmental matters and its search for new concepts that address current challenges.

Given that the research was exploratory and there has not been much of a focus on transformative SMEs in general and wood-processing SMEs specifically, we think that a few limitations need to be considered: Because our sample was selective and small encompassing only 24 enterprises, the incidence of SME types we describe (cf. Fig. 4) is not representative of the industry. We assume that the group of pragmatist traditionalists is larger at the industry-level than in our sample. Hence, generalizations must be made with caution and conclusions about the whole population of wood-processing SMEs in Bern are not possible. Regarding the sample structure, we emphasize that a different structure may have resulted in different types. Also, we note that enterprise types are stylized and based on our definition of transformative enterprises. Typification is always a balancing act between systematic summarization and analytic differentiation and is not always unambiguous.

The research design implied a spotlight at the micro-level of 24 SMEs, while we did not broadly analyze the industrial context. Besides, our results are specific to the Swiss context and not applicable to other countries without empirical verification. Another issue regarding the research design is the evaluation of SMEs transformative potential and change agency: The latter relied on SME owners own assessment. A longitudinal study of the enterprises history and interviews with industry experts could provide a more nuanced picture. Finally, our focus on the wood-processing industry goes along with limitations too: The SME types we found are industry-specific and reflect general characteristics of Swiss wood-processing enterprises. The latter are already relatively "green", small, and strongly embedded in the regions. Hence, it is likely that some SMEs display many characteristics of transformative enterprises just because they operate in this industry. Despite these limitations, this paper may serve as a future research agenda.

More empirical research on SMEs as agents of transformative change in various sectors would be needed to overcome the limitations mentioned. We sustain Martin et al., (2023, p. 10) call for more research on "*the roles and capacities of firms in contributing to the transformative industrial change of regional industries*". As characteristics conducive to transformative change, such as family ownership and regionalization, are widespread among SMEs (cf. Wirth, Ortlieb, & Demière, 2023), we deem it important to think of traditional but "unspectacular" and "normal" enterprises. Sustainability transformations will not work out without these core economic actors. Another avenue of future research concerns the limits of change agency. How can SMEs unfold their dormant change agency and implement changes beyond the firm-level (Blažek & Květoň, 2022, p. 14)? The study of maintenance agency (Steinböck & Trippl, 2023) and knowledge of structural barriers to transformative change, including the role of the state (Weller & Beer, 2022), could inform efforts to empower agents with transformative potential. To understand the limited power of single actors, one should moreover consider the wider network and industrial context firms are part of (Gibbs & O'Neill, 2014, p. 1102). Combining EEG with the sustainability transitions literature (Zhou et al., 2023) or applying institutional perspectives considering industry-relevant policies (Gong & Hassink, 2019) may be informative.

Filling these research gaps would pave the way to inform policy about supporting SMEs as actors of transformative change. Our study could be extended with research on institutional conditions limiting or enabling sustainability transformation and then advise the next update of the resource policy on wood. In this key policy for the industry, the bioeconomy is depicted as an important tool to save resources (Pauli-Krafft et al., 2021). In efforts to strengthen the bioeconomy in Switzerland, it may be important to consider ecological and social aspects found in silent ecologists, social pioneers, and visionary nonconformists that are less economically powerful. However, these enterprise types could contribute to the broader societal and economic transformation a future bioeconomy must engender (Losacker et al., 2023, pp. 1–2). Unlike the common bioeconomy narrative that incorporates the growth paradigm and is directed towards high-tech innovations (Giurca & Befort, 2023), the SME types we portrayed may be bearers of a different, rather low-tech bioeconomy that values regional resources, short value chains and social embeddedness. In any case, these characteristics must be considered for a (forest) bioeconomy in the Swiss context as large scale biorefineries are little realistic (Studer & Poldervaart, 2017, p. 5).

CRediT authorship contribution statement

Miriam Hug: Writing – review & editing, Writing – original draft, Visualization, Investigation, Conceptualization. **Heike Mayer:** Writing – review & editing, Supervision, Funding acquisition. **Irmi Seidl:** Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests. Miriam Hug reports a relationship with Wyss Academy for Nature at the University of Bern that includes: funding grants (grant number: WA-Bern-AWN-2_02). If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Affolderbach, J., & Krueger, R. (2017). Just'' ecopreneurs: Re-conceptualising green transitions and entrepreneurship. *Local Environment, 22*, 410–423. https://doi.org/10.1080/13549839.2016.1210591

Baumgartinger-Seiringer, S. (2022). The role of powerful incumbent firms: shaping regional industrial path development through change and maintenance agency. *Regional Studies, Regional Science, 9*, 390–408. https://doi.org/10.1080/21681376.2022.2081597

Baumgartinger-Seiringer, S., Miörner, J., & Trippl, M. (2020). Towards a stage model of regional industrial path transformation. *Industry and Innovation, 00*, 1–22. https://doi.org/10.1080/13662716.2020.1789452

Blair, M. J., Cabral, L., & Mabee, W. E. (2017). Biorefinery strategies: exploring approaches to developing forest-based biorefinery activities in British Columbia and Ontario, Canada. *Technology Analysis and Strategic Management, 29*, 528–541. https://doi.org/10.1080/09537325.2016.1211266

Blažek, J., & Květoň, V. (2022). Towards an integrated framework of agency in regional development: The case of old industrial regions. *Regional Studies, 0*, 1–16. https://doi.org/10.1080/00343404.2022.2054976

Bundesamt Für Umwelt (2022). Jahrbuch Wald und Holz 2022. Bern, 1– 108.

Donald, B., & Gray, M. (2019). The double crisis: in what sense a regional problem? *Regional Studies, 53*, 297–308. https://doi.org/10.1080/00343404.2018.1490014

Edenhoffer, K., & Hayter, R. (2013). Restructuring on a vertiginous plateau: The evolutionary trajectories of British Columbia's forest industries 1980-2010. *Geoforum, 44*, 139–151. https://doi.org/10.1016/j.geoforum.2012.10.002

Eder, J., & Döringer, S. (2022). The Limits of change agency: establishing a peripheral university campus in east tyrol. *Local Economy, 37*, 297–316. https://doi.org/10.1177/02690942221122100

Bundesamt für Statistik, 2019. Kleine und mittlere Unternehmen. Definition KMU Available at: https://www.bfs.admin.ch/bfs/de/home/statistiken/industrie-dienstleistungen/unternehmen-beschaeftigte/wirtschaftsstruktur-unternehmen/kmu.html [Accessed March 20, 2020].

European Commission. 2018. A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment. Updated bioeconomy strategy. Brussels, 1–107 pp.

Gibbs, D., & O'neill, K. (2014). Rethinking sociotechnical transitions and green entrepreneurship: The potential for transformative change in the green building sector. *Environment and Planning A, 46*, 1088–1107. https://doi.org/10.1068/a46259

Gibson, C., & Warren, A. (2020). Keeping time with trees: Climate change, forest resources, and experimental relations with the future. *Geoforum, 108*, 325–337. https://doi.org/10.1016/j.geoforum.2019.02.017

Gibson, C., & Warren, A. (2016). Resource-Sensitive Global Production Networks: Reconfigured Geographies of Timber and Acoustic Guitar Manufacturing. *Economic Geography, 92*, 430–454. https://doi.org/10.1080/00130095.2016.1178569

Giurca, A., & Befort, N. (2023). Deconstructing substitution narratives: The case of bioeconomy innovations from the forest-based sector. *Ecological Economics, 207*. https://doi.org/10.1016/j.ecolecon.2023.107753

Gong, H., & Hassink, R. (2019). Developing the Shanghai online games industry: A multi-scalar institutional perspective. *Growth and Change, 50*, 1006–1025. https://doi.org/10.1111/grow.12306

Gregory, D., Johnston, R., Geraldine, P., Watts, M., & Whatmore, S. (2009) (eds). *The Dictionary of Human Geography* (5th edition, pp. 1–1052). Chichester: Wiley-Blackwell, (eds).

Grillitsch, M. (2019). Following or breaking regional development paths: on the role and capability of the innovative entrepreneur. *Regional Studies, 53*, 681–691. https://doi.org/10.1080/00343404.2018.1463436

Grillitsch, M., Asheim, B., Isaksen, A., & Nielsen, H. (2022). Advancing the treatment of human agency in the analysis of regional economic development: Illustrated with three Norwegian cases. *Growth and Change, 53*, 248–275. https://doi.org/10.1111/grow.12583

Grillitsch, M., & Sotarauta, M. (2019). Trinity of change agency, regional development paths and opportunity spaces. *Progress in Human Geography, XX*, 1–20. https://doi.org/10.1177/0309132519853870

Grotz, R., & Braun, B. (1993). Networks, Milieux and Individual Firm Strategies: Empirical Evidence of an Innovative SME Environment. *Geografiska Annaler. Series B, Human Geography, 75*, 149–162.

Haberl, H., Wiedenhofer, D., Virág, D., Kalt, G., Plank, B., Brockway, P., Fishman, T., et al. (2020). A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: Synthesizing the insights. *Environmental Research Letters, 15*. https://doi.org/10.1088/1748-9326/ab842a

Hansen, T., & Coenen, L. (2017). Unpacking resource mobilisation by incumbents for biorefineries: The role of micro-level factors for technological innovation system weaknesses. *Technology Analysis and Strategic Management, 29*, 500–513. https://doi.org/10.1080/09537325.2016.1249838

Hauge, E. S., Kyllingstad, N., Maehle, N., & Schulze-Krogh, A. C. (2017). Developing cross-industry innovation capability: regional drivers and indicators within firms. *European Planning Studies, 25*, 388–405. https://doi.org/10.1080/09654313.2016.1276158

Hayter, R., & Edenhoffer, K. (2016). Evolutionary Geography of a Mature Resource Sector: Shakeouts and Shakeins in British Columbia's Forest Industries 1980 to 2008. *Growth and Change, 47*, 497–519. https://doi.org/10.1111/grow.12155

Hinton, J. (2021). Five key dimensions of post-growth business: Putting the pieces together. *Futures, 131*, Article 102761. https://doi.org/10.1016/j.futures.2021.102761

Hug, M., Mayer, H., & Seidl, I. (2022). Transformative enterprises: Characteristics and a definition. *Geography Compass*. https://doi.org/10.1111/gec3.12667

Isaksen, A., Jakobsen, S. E., Njøs, R., & Normann, R. (2018). Regional industrial restructuring resulting from individual and system agency. *Innovation: The European Journal of Social Science Research, 32*, 48–65. https://doi.org/10.1080/13511610.2018.1496322

Jakobsen, S. E., Uyarra, E., Njøs, R., & Fløysand, A. (2022). Policy action for green restructuring in specialized industrial regions. *European Urban and Regional Studies, 29*, 312–331. https://doi.org/10.1177/09697764211049116

Jolly, S., Grillitsch, M., & Hansen, T. (2020). Agency and actors in regional industrial path development. A framework and longitudinal analysis. *Geoforum, 111*, 176–188. https://doi.org/10.1016/j.geoforum.2020.02.013

Khmara, Y., & Kronenberg, J. (2018). Degrowth in business: An oxymoron or a viable business model for sustainability? *Journal of Cleaner Production, 177*, 721–731. https://doi.org/10.1016/j.jclepro.2017.12.182

Kluge, S. 2000. Empirically Grounded Construction of Types and Typologies in Qualitative Social Research. Forum Qualitative Social Research Available at: http://www.qualitative-research.net/fqs/.

Kristof, K. (2010). *Wege zum Wandel: Wie wir gesellschaftliche Veränderungen erfolgreicher gestalten können. 1. Auflage* (p. 160). München: Oekom Verlag,.

Kuckartz, U. (2010). Typenbildung. In G. Mey, & K. Mruck (Eds.), *Handbuch Qualitative Forschung in der Psychologie. VS Verlag für Sozialwissenschaften* (pp. 553–568).

Kyllingstad, N. (2020). *The role of firm-level actors and systemlevel actors in processes of new regional industrial path development*. Dissertation. *University of Agder*, 146.

Kyllingstad, N., & Rypestøl, J. O. (2019). Towards a more sustainable process industry: A single case study of restructuring within the Eyde process industry cluster. *Norsk Geografisk Tidsskrift, 73*, 29–38. https://doi.org/10.1080/00291951.2018.1520292

Lehner, L., Kinnunen, H., Weidner, U., Lehner, J., Pauli, B., & Menk, J. (2014). Branchenanalyse. Analyse und Synthese der Wertschöpfungskette (WSK) Wald und Holz in der Schweiz. Technischer Bericht im Auftrag des Bundesamtes für Umwelt BAFU, finanziert durch den Aktionsplan Holz. *Abensberg*, 314.

Losacker, S., Heiden, S., Liefner, I., & Lucas, H. (2023). Rethinking bioeconomy innovation in sustainability transitions. *Technology in Society, 74*. https://doi.org/10.1016/j.techsoc.2023.102291

Lüthi, T. (2020). Branchenspiegel Wald- und Holzwirtschaft Kanton Bern. Spiez, 16 pp.

Mackinnon, D., Dawley, S., Pike, A., & Cumbers, A. (2019). Rethinking Path Creation: A Geographical Political Economy Approach. *Economic Geography, 95*, 113–135. https://doi.org/10.1080/00130095.2018.1498294

Martin, H., Grundel, I., & Dahlström, M. (2023). Reconsidering actor roles in regional innovation systems: transformative industrial change in the forest-based bioeconomy. *Regional Studies*. https://doi.org/10.1080/00343404.2022.2151581

Martin, R. (2021). Rebuilding the economy from the Covid crisis: time to rethink regional studies? *Regional Studies, Regional Science, 8*, 143–161. https://doi.org/10.1080/21681376.2021.1919191

Mayer, H., Tschumi, P., Perren, R., Seidl, I., Winiger, A., & Wirth, S. (2021). How do social innovations contribute to growth-independent territorial development? Case studies from a Swiss mountain region. *Die Erde, 152*, 218–231. https://doi.org/10.12854/erde-2021-592.

Mayring, P., & Fenzl, T. (2019). Qualitative Inhaltsanalyse. In N. Baur, & J. Blasius (Eds.), *Handbuch Methoden der empirischen Sozialforschung* (pp. 633–648). Wiesbaden: Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-21308-4.

Mazzucato, M. (2018). Mission-oriented innovation policies: Challenges and opportunities. *Industrial and Corporate Change, 27*, 803–815. https://doi.org/10.1093/icc/dty034

Miörner, J. (2022). Contextualizing agency in new path development: how system selectivity shapes regional reconfiguration capacity. *Regional Studies, 56*, 592–604. https://doi.org/10.1080/00343404.2020.1854713

Morisson, A., & Mayer, H. (2021). An agent of change against all odds? The case of Ledger in Vierzon, France. *Local Economy: The Journal of the Local Economy Policy Unit, 36*, 430–447. https://doi.org/10.1177/02690942211052014

Murphy, J.T. 2012. Global Production Networks, Relational Proximity, and the Sociospatial Dynamics of Market Internationalization in Bolivia's Wood Products Sector, 208–233 pp.

Murphy, J. T., & Schindler, S. (2011). Globalizing development in Bolivia? Alternative networks and value-capture challenges in the wood products industry. *Journal of Economic Geography, 11*, 61–85. https://doi.org/10.1093/jeg/lbp059

Nesterova, I. (2020). Degrowth business framework: Implications for sustainable development. *Journal of Cleaner Production, 262*, 1–10. https://doi.org/10.1016/j.jclepro.2020.121382

Pauli-Krafft, U., Suter, C.-L. & Aebischer, C. 2021. Ressourcenpolitik Holz 2030. Strategie, Ziele und Aktionsplan Holz 2021 - 2026. Umwelt-Info Nr. 2103 Available at: www.bafu.admin.ch/ui-2103-d [Accessed October 3, 2023].

Pfriem, R. (2021). *Transformative Unternehmen und die Veränderung der Unternehmenslandschaft. In Die Neuerfindung des Unternehmertums. Solidarische Ökonomie, radikale Demokratie und kulturelle Evolution* (pp. 265–300). Marburg: Metropolis-Verlag,.

Pfriem, R., Antoni-Komar, I., & Lautermann, C. (2015). Transformative Unternehmen. *Ökologisches Wirtschaften - Fachzeitschrift, 30*, 18. https://doi.org/10.14512/oew300318

Schneidewind, U. (2019). *Die Grosse Transformation: eine Einführung in die Kunst gesellschaftlichen Wandels*. 3. Auflage. *Frankfurt am Main: Fischer Taschenbuch*, 528 pp..

Scholl, G., & Mewes, H. (2015). Unternehmen als Mitgestalter sozial-ökologischer Transformation: Thesen des Instituts für ökologische Wirtschaftsforschung (IÖW). *Ökologisches Wirtschaften - Fachzeitschrift, 30*, 15. https://doi.org/10.14512/oew300315

Schot, J., & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy, 47*, 1554–1567. https://doi.org/10.1016/j.respol.2018.08.011

Schulz, C. (2005). *Agenten des Wandels? Unternehmensbezogene Umweltdienstleister im industriellen Produktionssystem*. München: oekom verlag,.

Schulz, C., & Bailey, I. (2014). The green economy and post-growth regimes: Opportunities and challenges for economic geography. *Geografiska Annaler, Series B: Human Geography, 96*, 277–291. https://doi.org/10.1111/geob.12051

Schulz, C., & Soyez, D. (2003). Agenten des Wandels. *Zeitschrift für Wirtschaftsgeographie*, 15–28.

Slavec, A. (2022). Underrated Innovativeness of Micro-Enterprises Compared to Small to Medium Enterprises in the Slovenian Forest-Wood Sector. *Sustainability, 14*. https://doi.org/10.3390/su14041991

Sotarauta, M., Suvinen, N., Jolly, S., & Hansen, T. (2021). The many roles of change agency in the game of green path development in the North. *European Urban and Regional Studies, 28*, 92–110. https://doi.org/10.1177/0969776420944995

Steinböck, N., & Trippl, M. (2023). The thorny road towards green path development: the case of bioplastics in Lower Austria. *Regional Studies, Regional Science, 10*, 735–749. https://doi.org/10.1080/21681376.2023.2244572

Studer, M., & Poldervaart, P. (2017). Neue Wege zur holzbasierten Bioraffinerie. Nationales Forschungsprogramm NFP 66 Ressource Holz. *Bern*, 54.

Suitner, J., Haider, W., & Philipp, S. (2022). Social innovation for regional energy transition? An agency perspective on transformative change in non-core regions. *Regional Studies*. https://doi.org/10.1080/00343404.2022.2053096

Taverna, R., Hofer, P., Werner, F., Kaufmann, E., & Thürig, E. (2007). The CO_2 Effects of the Swiss Forestry and Timber Industry. Scenarios of future potential for climate-change mitigation. *Environmental Studies*, (739), 102.

Tödtling, F., Trippl, M., & Desch, V. (2021). New directions for RIS studies and policies in the face of grand societal challenges. *European Planning Studies, 0*, 1–18. https://doi.org/10.1080/09654313.2021.1951177

Trippl, M., Baumgartinger-Seiringer, S., Frangenheim, A., Isaksen, A., & Rypestøl, J. O. (2020). Unravelling green regional industrial path development: Regional preconditions, asset modification and agency. *Geoforum, 111*, 189–197. https://doi.org/10.1016/j.geoforum.2020.02.016

Weller, S., & Beer, A. (2022). State structures and the limits of agency: governing the transformation from coal in Australia. *Regional Studies*. https://doi.org/10.1080/00343404.2022.2047918

Wiefek, J., & Heinitz, K. (2018). Common good-oriented companies: Exploring corporate values, characteristics and practices that could support a development towards degrowth. *Management Revue, 29*, 311–331. https://doi.org/10.5771/0935-9915-2018-3-311

Wirth, D., Ortlieb, C., & Demière, J. (2023). INSIGHTS: WEGE ZUR NACHHALTIGKEIT. Pioniere gewähren wertvolle Einblicke in ihr Nachhaltigkeits-Management. *Studienbericht*, 1–77.

Wissenschaftlicher Beirat Globale Umweltveränderungen. (2011). *Hauptgutachten. Welt im Wandel: Gesellschaftsvertrag für eine Große Transformation. 2. Auflage* (pp. 422–pp). Berlin: Wissenschaftlicher Beirat Globale Umweltveränderungen (WGBU.

Zhou, Z., Chung, C. K. L., & Xu, J. (2023). Geographies of green industries: The interplay of firms, technologies, and the environment. *Progress in Human Geography, 47*, 680–698. https://doi.org/10.1177/03091325231188377

7 How regional innovation systems (RIS) integrate sustainability challenges

Article 3

Full title: How regional innovation systems (RIS) integrate sustainability challenges: RIS reconfiguration in the timber sector

Authors: Miriam Hug, Irmi Seidl, Heike Mayer

Journal: Regional Studies Regional Science

Status: Under revision

How regional innovation systems (RIS) integrate sustainability challenges: RIS reconfiguration in the timber sector

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Abstract

Given ecological and economic challenges in natural resource-based industries, the timber sector is usually not perceived as particularly innovative or transformative. However, in the Austrian province of Vorarlberg, this industry has played a key role in socio-economic transformation since the 1960s when so-called *Baukünstler* (building artists) started to revolutionize the local architectural scene with their timber houses. They induced changes which led to the integration of sustainability challenges in the regional innovation system (RIS) of the timber sector. In contrast, the timber sector of the Canton of Bern in Switzerland represents a case of latecomer when it comes to transformative changes. By drawing on the concept of challenge-oriented regional innovation system (CORIS) and comparing the case of Vorarlberg with that of Bern, we study RIS reconfiguration, i.e. how RISs integrate sustainability challenges and eventually become a CORIS. The comparison is insightful for identifying RIS elements (actors, networks and institutions) which enhance challenge orientation. Moreover, it indicates that individual change agents with extra-regional connections and networking capabilities are key bearers of system-level change agency. Our insights contribute to understanding transformation processes at a systemic level and illustrate how natural resource-based industries can show the way to sustainable futures.

timber sector | sustainability transformation | challenge-oriented regional innovation system | RIS reconfiguration | comparison | Vorarlberg | Bern

1 Introduction

In mountain regions, which dominate large parts of Austria and Switzerland, the timber sector faces challenges such as regional value creation and promoting timber construction practices. At the same time, the sector is not known for being particularly innovative or transformative (Nilsen *et al.* 2024). However, in the Austrian province Vorarlberg, this industry has played a pioneering role in socio-economic transformation since the 1960s when so-called *Baukünstler* (building artists) started to revolutionize the local architectural scene with their ecological and community-oriented timber houses (Grabher 2018). The *Baukünstler* movement soon radiated into other realms and induced transformations in the entire region, which has today become a showcase for sustainable development (Gauzin-Müller 2020). Challenge-oriented initiatives of the timber sector geared towards regional value creation and the promotion of timber construction practices supported this transformation. Hence, Vorarlberg's regional innovation system (RIS) around the timber sector can serve as an example of a challenge-oriented regional innovation system (CORIS) (Tödtling *et al.* 2021). In this paper, we study RIS reconfiguration, i.e. how RISs integrate sustainability challenges, by contrasting the Vorarlberg case with the case of Bern (Switzerland). Compared to Vorarlberg, the Bernese timber sector could be labelled a latecomer because challenge-oriented initiatives are only emerging. The two cases thus represent different stages of RIS reconfiguration. Their comparison can advance our understanding of different paths of RIS reconfiguration, including systemic aspects and innovation dynamics in transformation processes.

The notion of challenge-oriented regional innovation systems (CORIS) resulted from a recent revision of the RIS concept (Asheim *et al.* 2019, p. 13). In 2021, Tödtling et al. (2021) introduced the notion of CORIS upon the observation that conventional RIS studies almost exclusively focus on innovation in the firm sector and that the concept fails to address grand challenges like climate change or economic distortions. The CORIS approach goes beyond the technocentric view which so far dominated RIS studies and emphasizes place-based problems and needs. Additionally, it addresses RIS reconfiguration, that is, changes in RIS aiming at the integration of sustainability challenges (Trippl *et al.* 2024b). Therefore, the CORIS concept pays attention to RIS elements which may enhance challenge orientation, including previously overlooked innovation actors and new types of networks (Trippl *et al.* 2024a). CORIS moreover acknowledges the importance of system-level agency which may change the RIS structure and hence contribute to RIS reconfiguration (ibid.).

Even though the CORIS concept has recently been applied in empirical studies – for example on e-mobility in Vorarlberg (Tödtling *et al.* 2021), the construction sector in Hesse, Germany (Campos Mühlenhoff & Herzig 2024) or on the circular economy in the German Aachen region (Fromhold-Eisebith 2024) – the link between system-level change agency and RIS reconfiguration is still little understood (Trippl *et al.* 2024a, pp. 6–7). Accordingly, the question who performs change agency – be it firms, cluster organizations, policy makers, universities, civil society actors or others – often remains unanswered (ibid.). Regarding these questions, systematic comparative studies of different CORISs could be insightful (ibid., p.5). But there is a lack of knowledge on how regions change their RISs in response to grand societal challenges (Tödtling *et al.* 2021, p. 15). Strategies of peripheral and mountain regions are of particular interest here (Trippl *et al.* 2024a, p. 5), as these types of regions often face innovation barriers such as organizational thinness or RIS fragmentation (Tödtling & Trippl 2005). With

our comparison of an established and an emerging CORIS around the timber sectors in mountain regions, we address these research gaps.

The timber sector has received little attention in economic geography but is ascribed a key role in sustainability transformations due to CO_2 storage in wood and its potential to substitute polluting materials (e.g., European Commission 2018). While the wood-processing industry is lately receiving more attention due to the growing popularity of bioeconomy strategies (e.g., Jolly *et al.* 2020, Martin *et al.* 2023, Blair *et al.* 2017), RIS studies in economic geography on the timber sector are missing. Only adjoining disciplines have addressed how RISs support innovations in forestry (Kubeczko *et al.* 2006) or have studied the role of policies in building a RIS for the bioeconomy (Purkus *et al.* 2018). Given planetary boundaries, there is a need to better understand the timber sector and natural resource-based industries in general (Bélis-Bergouignan & Levy 2010, Chlebna *et al.* 2024). Moreover, the timber sector creates important job opportunities in the local economy of mountain regions and should therefore be considered in regional development.

We approach the overall question why the Vorarlberg and Bern timber sectors differ in terms of challenge orientation with two specific research questions. The first addresses the systemic level and the second dives into the micro-level of firms, organizations and individuals:

(1) What elements (actors, networks, institutions) of the RIS around the Vorarlberg and Bernese timber sector enhance challenge orientation?

(2) Who exerts system-level change agency and how does this agency manifest?

In the next chapter (2) we describe the CORIS approach, more closely. Then, in chapter 3, follows the outline of the qualitative comparative case study design. Chapter 4 characterizes the two case study regions. Subsequently, RIS elements enhancing challenge orientation in Vorarlberg and Bern are described and system-level change agency is examined (chapter 5). Chapter 6 discusses the results and concludes.

2 Theoretical approach

The concept of challenge-oriented regional innovation systems (CORIS) (Tödtling *et al.* 2021) is useful for our study of RIS adaptation to the challenges of regional value creation and promoting timber construction practices. This concept analyzes the three key elements of a RIS, namely actors, networks and institutions, and the systemic interdependences between them (Asheim *et al.* 2019, p. 2). Figure 1 which presents the structure of a CORIS and names the RIS elements we considered, illustrates that actors, networks and institutions can be situated in all three subsystems of a RIS, the production subsystem, the knowledge generation and diffusion subsystem, and the policy subsystem. Figure 1 also shows that RIS elements are embedded in a wider socio-economic institutional and cultural setting. This setting includes a regional set of formal rules and informal norms, which is said to enable or constrain the functioning of a RIS (ibid., p.2-3). In addition to considering traditional RIS elements, the CORIS approach is attentive to previously overlooked innovation actors like civil society groups, public sector actors, municipalities, users and citizens, and new types of networks and institutions (green boxes in Figure 1) because these are recognized as playing a key role in the development, application and scaling of innovative solutions for territorial challenges (ibid.; Trippl *et al.* 2024b, Trippl 2023). Hence, CORIS extends the conventional focus of RISs on technological innovations in the firm sector to encompass diverse forms of innovation such as social[1], institutional[2] or user[3] innovations (Trippl *et al.* 2024a). This paper aims at identifying innovation actors, networks and institutions in a CORIS but does not focus on innovation types and processes. In summary, CORIS can be defined as *"(those parts of) RISs that feature challenge orientation"* (Tödtling *et al.* 2021, p. 6).

[1] Social innovations are new forms of collaborations at the individual or organizational level that lead to novel ideas that are at least considered for implementation. Social innovations may positively affect society, improve the quality of life and change social or power relations (Tschumi *et al.* 2020, p. 120).

[2] Institutional innovations are defined as *"novel, useful, and legitimate change that disrupts, to varying degrees, the cognitive, normative, or regulative mainstays of an organizational field"* (Raffaelli & Glynn 2015). Hargrave & Van de Ven (2006) moreover emphasize that institutional changes which are "*novel or unprecedented from the past"* (p.866) represent institutional innovations.

[3] User innovation is new product and service development (or improvement) by intermediate users (e.g. firms) or consumers (individuals or communities) rather than by suppliers (producers, manufacturers) (Bogers *et al.* 2010, Von Hippel 2016).

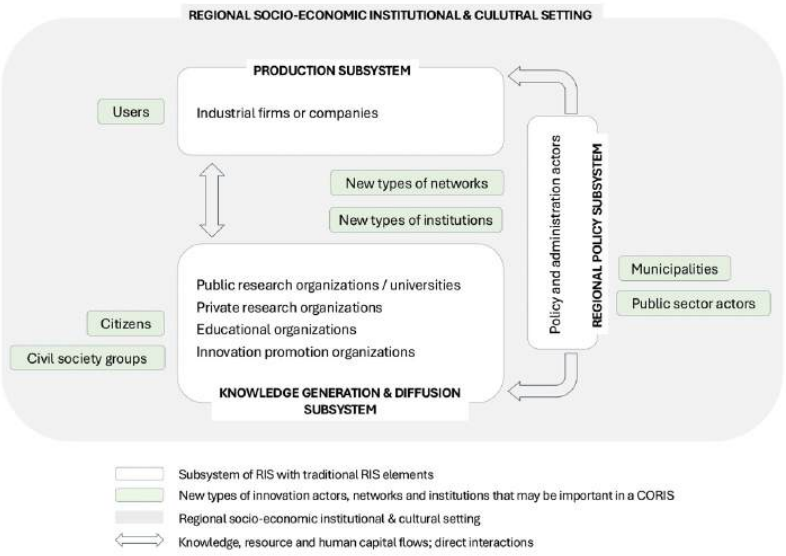


Figure 1: The structure of a CORIS, incl. the elements considered in this study (modification of Tödtling & Trippl 2005, p. 1206).

The CORIS concept triggered interest in the reconfiguration processes RISs undergo to enhance their challenge orientation (Trippl *et al.* 2024b, p. 4f.). Two ideal-typical routes of RIS reconfiguration are identified: reorientation and transformation (Isaksen *et al.* 2022). While the reorientation route mobilizes assets, actors, networks and institutional structures of existing RISs to pursue new goals, the transformation route is characterized by the creation of new challenge-oriented structures along with the destruction of old, unsustainable ones. The latter route includes new innovative actors, it forms new networks and induces institutional change processes (Trippl *et al.* 2024b, p. 5). Table 1 summarizes the CORIS approach.

Table 1: Differences between RIS and CORIS (own compilation based on Tödtling et al. 2021, Isaksen et al. 2022).

	Traditional RIS	**Challenge-oriented RIS (CORIS)**
Type of **actors** considered	Traditional "triple helix" actors: • Firms, trad. economic actors • Research & higher education, funding agencies • Policy makers	Diverse types of actors, in addition to "triple helix actors", e.g.: • Civil society • Public sector • Users, etc.
Types of **networks**	Stable networks, embedded in a static, multi-scalar institutional environment	Dynamically developing networks, embedded in an evolving multi-scalar institutional environment
Types of **institutions**	Static multiscalar institutional landscape	Evolving institutional configurations at multiple scales (regional, national etc.)
Mode of **RIS reconfiguration**	RIS reorientation	RIS reorientation and transformation

To date, RIS change is little researched (Steinböck & Trippl 2023, p. 736), except for Trippl et al. (2024b) whose conceptual model of RIS reconfiguration depicts how a RIS may develop into a CORIS. The model is attentive to three analytical categories: (1) the initial situation of a region, (2) core

processes of RIS reconfiguration, and (3) the outcomes. Regarding the *first* category, knowledge on historically grown socio-economic structures, including assets and challenges, should be collected. In the s*econd* category, the investigation of four core processes allows understanding RIS reconfiguration: *challenge-asset identification* (how do regional actors identify and frame challenges and where do they make out opportunities?), *innovation-development-diffusion* (what solutions to these challenges are developed and what kinds of innovation are involved in this process?), *unlocking-destabilization* (are there old unsustainable paths and RIS structures which are destabilized? If yes how?), and *orchestration* (how and by whom are changes in the RIS structure coordinated and mediated?). As regards the *third,* category, outcomes allow to assess whether a CORIS emerged or old unsustainable paths were continued (Trippl *et al.* 2024b, pp. 5–8).

The model of RIS reconfiguration can guide empirical analysis. We therefore used it in our study (see chapter 3, Figure 2), adding an explicit focus on system-level agency which may be an additional step in explaining changes in RISs (Trippl *et al.* 2024a, pp. 6–7): Actors can exert system-level agency and become change agents through activities like creating new system elements (e.g. a research center), collective vision building, networking, resource mobilization, institutional adaptation, legitimation of change, or policy design and implementation (Trippl *et al.* 2024a). At the same time, other actors may counter pressures for change with system-level maintenance agency, like supporting persistent institutional routines or narratives (Jolly *et al.* 2020, p. 179). The following data analysis and presentation of results are based on the model of RIS reconfiguration.

3 Method

For the comparative case study of the timber sector in Vorarlberg (Austria) and Bern (Switzerland), we adopted a qualitative research design drawing on document analysis and expert interviews. We chose the two regions because of their different stages of evolution into a CORIS and their contrasts in terms of value creation and firm structure (cf. chapter 4): Based on previous research and insights from the literature (e.g., Gauzin-Müller 2011, Grabher 2018), we consider Vorarlberg a pioneer region and Bern a latecomer. The comparison allows us to identify actors, networks and institutions that enhance challenge orientation.

Our research design is oriented along the three analytical categories in the model of RIS reconfiguration (Trippl *et al.* 2024b) discussed in section 2 and represented in Figure 2. *First,* we identified challenges to sustainability transformation in the timber sector (step 1.1) and then analyzed, mapped and compared the emerging CORISs in Vorarlberg and Bern with a focus on actors, networks and institutions (step 1.2). Then, in a *second* step, we studied past developments in the sector that had led to CORIS emergence (step 2.1) and identified system-level agency and agents (step 2.2). *Finally,* we assessed the outcomes (step 3).

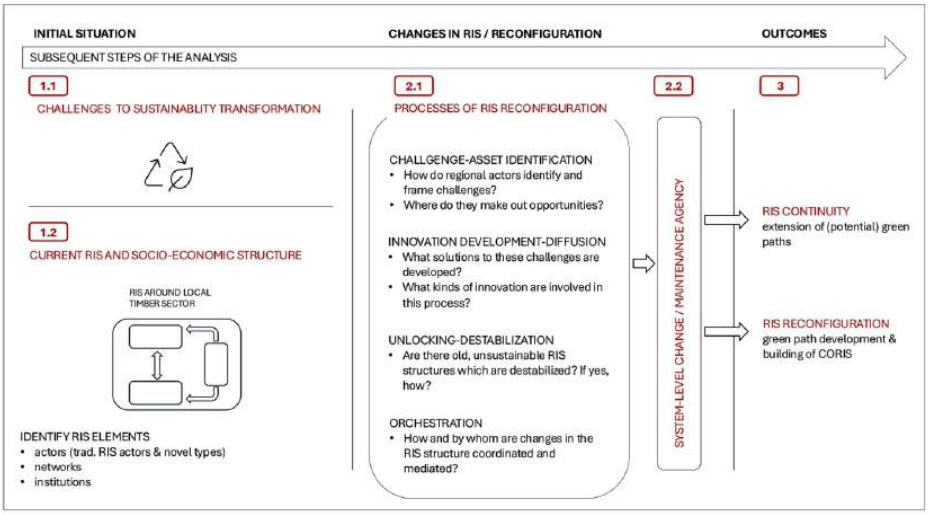


Figure 2: Overview of analytical steps undertaken (own presentation based on Trippl et al. 2024b, p. 6).

Document analysis and expert interviews fed into all analytical steps, whereas the analysis in steps 1.1 and 2.1 was predominantly based on interviews, and steps 1.2 and 2.2 mostly drew on document analysis. For the latter, we studied academic and grey literature on the timber sector and analyzed data on the socio-economic structure in Vorarlberg and Bern in detail. Expert interviews, which were held with 24 key RIS actors (cf. Table 2), touched upon the development of the regional timber sector, sustainability-related challenges, the way in which actors have been influencing RIS dynamics, and the entrepreneurial environment in relation to socio-economic transformation.

Personal contacts, desktop research and recommendations (snowball sampling) helped recruiting 11 interview partners in the Vorarlberg region and 13 in Bern. 11 interviews were conducted on site, another 12 interviews online. During interviews we took notes and recorded and transcribed them. Subsequently, interviews and field notes were coded using the software MAXQDA. For the analysis, we applied qualitative content analysis drawing on Mayring and Fenzl (2019, p. 640).

*Table 2: Overview of interview partners (persons covering more than one RIS actor role are marked with a *).*

No.	RIS actor	Organization or enterprise	Region VA = Vorarlberg BE = Bern	On site	Length
1	Industry associations	Holzindustrie Schweiz	BE		55min
2*		Waldverband Vorarlberg	VA	X	55min
3		ProHolz Austria	VA		50min
4*		VSSM Sektion Bern	BE	X	50min
5*		Holzbau Schweiz, Sektion Bern	BE	X	50min
2*	Politics and administration	Landwirtschaftskammer Vorarlberg	VA	X	55min
4*		Grosser Rat (Legislative)	BE	X	50min
5*		Grosser Rat (Legislative)	BE	X	50min
6		Amt für Wald und Naturgefahren	BE		1h 10min
7*	Research	Bern University of Applied Sciences, School of Architecture, Wood and Civil Engineering	BE		1h
8		Bern University of Applied Sciences, School of Architecture, Wood and Civil Engineering	BE		1h
9		Vorarlberg institute for architecture	VA	X	45min
10	Architects and timber engineers	Timber engineering firm	BE		55min
11		Timber engineering firm	BE	X	1h 15min
12		Timber engineering firm	BE		1h
13		Timber engineering firm	VA		45min
14		Architectural office	VA		40min
7*	Innovation promotion, cluster organizations	Swiss Wood Innovation Network (S-WIN)	BE		1h
15		Swiss Wood Innovation Network (S-WIN)	BE		1h
16		Vorarlberger Holzbaukunst	VA		1h
17	Micro-enterprises (1-9 EMPL)	Enterprise	BE	X	45min
18		Enterprise	VA	X	45min
19	Small enterprises (10-49 EMPL)	Enterprise	VA	X	1h
20		Enterprise	BE	X	50min
21		Enterprise	VA	X	1h
22		Enterprise	VA		30min
23	Medium-sized enterprises (50 – 249 EMPL)	Enterprise	BE		1h 5min
24	Large enterprises (> 250 EMPL)	Enterprise	VA	X	55min

4 Case study regions: situation and challenges

Our case study regions are located in Austria and in Switzerland, two neighboring countries in Central Europe. We compare two regions, Vorarlberg (Austria) and Bern (Switzerland) (cf. Figure 3), which are similar in terms of natural landscape and socio-economic conditions. However, timber is very present as a building material in Vorarlberg, while in Bern it is not as visible, and sustainability discussions and regulations seem more advanced in the former. In the following, we describe similarities and differences of the case study regions, including the challenges in the timber sector which we identified through interviews and desktop research. This section takes up the first analytical category (initial situation of the region) in the model of RIS reconfiguration we used (cf. 1.1 & 1.2 in Figure 2).

Figure 3: The two case study regions (map: N. Suter & J. Lanz).

Although Vorarlberg is smaller than Bern, the socio-economic conditions and natural landscape of the regions are comparable. Differences concern the structure and performance of the timber sector (cf. Table 3). While timber harvest is slightly lower than timber increment in both regions, differences start with the amount of raw timber exported for processing (within-country and abroad): the share is higher in Bern (48%) (calculation based on Lüthi 2021, p. 18) than in Vorarlberg (22%) (calculation based on Drexel 2023, p. 14). This implies that in Bern value added is not captured in the region (Lüthi 2021, p. 18). Vorarlberg on the contrary has more sawing capacity as there are large, industrialized sawmills. Sawn timber is among the main exports of the Vorarlberg wood value chain (Regionalentwicklung Vorarlberg eGen & Telesis GmbH 2018, p. 6). These differences reflect that, compared to Austria, Switzerland did not see major investments in the sawing industry after WWII. Swiss sawmills remained small, little technologized and geared towards the domestic market (Lehner *et al.* 2003, pp. 7–8). Even though the sector's contribution to value added of the region seems small in terms of numbers, wood-processing enterprises provide a significant number of jobs in the mountainous parts of both regions. In Vorarlberg, the regional value chain is healthier than in Bern, but the Austrian province also depends on imports of higher-quality products like construction timber.

218 According to our interviews, the challenges the timber sector faces are similar in Vorarlberg and
219 Bern. In the following, we report on two challenges that are particularly pronounced in both regions,
220 and that also emerged from our document analysis: regional value creation and the promotion of timber
221 construction, including circular economy practices. The first challenge is regional value creation which
222 is under pressure. Especially wood harvesting and sawing cause concern: wood harvesting yields little
223 money as the examined regions have strict forest laws, small-scale ownership structures in forests and
224 topographical challenges. At the same time, harvesting and reforestation would be needed to adapt
225 forests to the hotter climate (I-14, VA[4]). Regarding sawing, competition by large players is pronounced:
226 Particularly in Bern the industry is struggling and has seen intense restructuring with firm closures and
227 concentration dynamics over the past decades (I-1, BE; I-17, VA). Moreover, the value chain in both
228 regions is lacking a producer of laminated wood used in modern timber architecture. As interviewees
229 noted, it would, however, be difficult to set up a new production plant because land is scarce in the
230 densely populated regions (I-13, VA). Firm closures and incomplete regional value chains imply that
231 the volume and length of timber transports increases and that local job opportunities may get lost.
232 Regional value creation is also hampered by the need to remain economically competitive. Competition
233 has increased cost and time pressures – especially in small SMEs who compete with large players (I-13
234 & I-17, VA). Swiss SMEs additionally lament unfair conditions because of strict regulations in
235 Switzerland and subsidies (for energy or land) in neighboring countries. Cost pressures moreover inhibit
236 the use of ecological products in timber construction which are usually more expensive (I-11 & I-12,
237 VA).
238 The second challenge is the promotion of timber construction and implementation of circular
239 economy practices. Promoting timber construction is difficult for three reasons. First, timber has long
240 had a bad reputation as a building material (this has changed in Vorarlberg significantly earlier than in
241 Bern). Second, the timber sector is confronted with a strong lobby for cement which now also promotes
242 "green" or "recycled" cement (I-1, BE) (which is also more pronounced in Bern than in Vorarlberg).
243 And third, the general population is increasingly critical about wood harvesting (I-19; BE) which
244 complicates regional wood provisioning. If timber is used for construction, the implementation of
245 circular economy practices poses a challenge: Many wood products are not yet reusable in the sense of
246 a circular economy due to composites like plastic and glue, but also metallic parts like screws or cement
247 (I-14, BE; I-12, VA). New products and building systems would need to be developed. This is, however,
248 hampered by the facts that so far circular or at least cascadic uses of the resource wood are unprofitable,
249 amongst others because wood recycling is expensive, and burning wood for energy production lucrative
250 (I-19, BE). The drive to develop new products remains low, because generally, climate change is not
251 much of a topic in the construction industry (I-22, VA).
252 Table 3 compares the two regions and highlights major challenges. We illustrate the different
253 conditions these regions face, which is important for the in-depth comparison of RIS reconfiguration
254 that we present in the following chapter.

[4] I-XY = interviewee no. XY; VA = interviewee from Vorarlberg; BE = interviewee from Bern

Table 3: Characterization of the two case study regions.

	Characteristic	Bern (BE)	Vorarlberg (VA)
Socio-economic conditions	Municipalities (no.)	338	96
	Population (pers. by 2022)	1,051,437	406,886
	BIP per inhabitant (2022)	83,967 CHF (=84,855.76 EUR)*	56,800 EUR (=56'200 CHF)*
	Political organization	• Democratic, federalist • Dominating parties: conservatives (SVP) • Political centrality: The Canton of Bern harbors the capital Bern	• Democratic, federalist • Dominating parties: conservatives (ÖVP) • Political peripherality: Vorarlberg is far from the capital Vienna
Natural landscape	Area (ha)	595,850	260,300
	Area covered in wood (%)	30.7	37
	Protective forest (%)	52	50
	State of forest	Strict forest laws: harvest below timber increment; no monocultures or clear cutting Major problems: Overaging of forest, browsing by game, pest infestations and other calamities related to climate change (fires, storms etc.)	
Features of timber sector	Yearly timber increment and harvest (m^3)	Increment: 1.650.000 Use: 1.410.000	Increment: 610.000 Use: 400.000
	Wood harvest exported as raw wood/ processed in regional sawmills (%)	48% is exported, 22% is processed regionally **	22% is exported, 27% is processed regionally **
	Share of wood harvest used as energy wood (%)	30 %, upward tendency**	40 % **
	Export of timber	Mostly raw timber (logs, industrial timber)	Mostly sawn timber
	Import of timber	Mainly higher-quality semi-finished and finished products (incl. construction timber) as well as paper and cardboard.	Mainly construction timber.
	Employees in regional timber sector (no./%)	12,844 (full- and part-time; by 2016) = approx. 2% of total no. of employees	3,500 (full-time; by 2018) = approx. 2% of total no. of employees
	Ownership structures and size of firms in sector	• Small-structured **forest ownership** (ca. 66 % of forest owners own small forests) → challenge for resource availability • Sector is generally **small-structured**, no large-scale industrialization after WWII • SMEs (1-149 empl.) dominate; mainly micro-enterprises (1-9 empl.)	• Small-structured **forest ownership** (65% of forest owners own small forests) → challenge for resource availability • Sector is still **to some degree small-structured** (e.g. small sawmills in villages), but also **larger industrial firms** • SMEs dominate; a few large firms (> 250 empl.)
	Architectural offices with focus timber construction	ca. 19++	26
	Socio-economic importance of sector	• **Traditional wooden architecture** dominates the rural parts of the Canton, modern timber architecture is only emerging. • Sawing and wood harvesting saw **stagnating production values and value-added** in the last 20 years. • Switzerland's **sawing industry** is small-structured and geared to the domestic market. Hardly 10% of production is exported. **Closures of small sawmills**. • **Regional value chain** is interrupted due to recent closure of two big processors of industrial timber (paper mill & producer of particle boards). • Sector contributes 1.8% to the Cantonal **gross value added**.	• **Timber architecture** and woodworking have a long tradition in Vorarlberg; province has been internationally **renowned for modern timber architecture** since 1970s. • **Sawing is profitable**. The five largest sawmills are processing approx. 75% of the harvested timber. These sawmills moreover process wood from the neighboring countries (CH, DE; 50% of production). • Austrias **sawing industry** is **internationally leading**. Ca. 60% of sawed timber is exported. Closures of small sawmills. • **Regional value chain** is relatively healthy and strengthened by **regional timber cluster** (*Vorarlberger Holzbaukunst*). Lacking capacity for the production of construction timber (solid structural timber, glued wood, ceiling elements etc.). • Wood processing contributes 4.5% to Vorarlberg's industrial production (2021)

Sources: Berner Fachhochschule (2024), Bundesamt für Umwelt BAFU (2022), Drexel (2023), Fachverband Holzindustrie Österreich FVHI (2023), Finanzverwaltung Kanton Bern (2023), Forstwesen Vorarlberg (2021), Gauzin-Müller (2011), Kleissner (2021), Knecht (2023), Lehner et al. (2003), Lüthi (2021), Mitterlechner & Weber (2022), Pauli-Krafft et al. (2021), Regionalentwicklung Vorarlberg eGen & Telesis GmbH (2018), Rücker et al. (2018), statista (2024).

* The comparative price level is: 100 (Austria), 159 (Switzerland) which amounts to similar purchasing powers (OECD 2024).

** Calculations based on Lüthi 2021, p.18 and Drexel 2023, p.14

++ Own calculation based on holzbaukultur.ch

5 RIS reconfiguration in Vorarlberg and Bern

Even though the initial situation of the Vorarlberg and Bern timber sectors is comparable in terms of challenges, the regions differ regarding RIS configuration and CORIS development. In the following, we present the second and third analytical step (cf. 2.2, 2.3 & 3 in Figure 2). We first dive into the micro-level of RIS reconfiguration processes and illuminate who exerted system-level change agency (chapter 5.1). Then, we zoom out to the larger system and identify RIS elements that enhanced challenge orientation (chapter 5.2).

5.1 The carriers of system-level change agency or two stories of RIS reconfiguration

The province of Vorarlberg is today renowned for its timber architecture and has become an incubator of innovation in wood integrated solutions (modular construction, networking between companies, renewal of building envelopes) (Caneparo & Dallere 2024, p. 40). The road there involves a history of profound transformation since the 1960s. At this time, change agents, who were a group of young architects who called themselves *Baukünstler* (building artists), entered the scene and started exerting system-level change agency. They had their roots in the region with a century-old tradition of wooden architecture and learned and pursued trades (e.g. brick layer, carpenter) before studying architecture outside Vorarlberg (Grabher 2018, p. 4). As the Vorarlberg building law does not require a planner authorized under civil law or by chamber membership for the approval of new buildings, the *Baukünstler* were able to build directly after their studies, and autodidacts could realize buildings too (Kapfinger 2003, p. 13). The *Baukünstler* identified with a counterculture of the post-war 1960s that emerged from a network of teachers, artists, writers, musicians, graphic designers and planners (Kapfinger 2003, p. 9). Leading exponents were critical of commercialization, attentive to ecological concerns and propagated affordable housing through simple, collaborative and resource-saving architecture (ibid.; Dangel 2009, p. 275). Initially, the public criticized the houses they built (Caneparo & Dallere 2024, p. 38).

The *Baukünstlers'* change agency developed visibility when their architectural style became part of the dominant culture in the 1980s – a process fueled by their rebellion against the far-away capital Vienna: The *Baukünstler* refused to comply with the mandatory membership in the national chamber of architects and asserted their position by forming the *Association of the Vorarlberger Baukünstler* in 1984 (Grabher 2018, p. 4). This evoked sympathy in Vorarlberg's population, sparked interest for architecture, and facilitated the acceptance of modern timber architecture (Gauzin-Müller 2011, p. 13f.). Eventually, the *Baukünstler* received large and public construction tasks like schools, sports facilities, apartment houses and industrial buildings (ibid., p.14; Kapfinger 2003, p. 16). What had been a social movement thus became an institutionalized field. This was reinforced by municipalities establishing voluntary design advisory bords, so-called *Gestaltungsbeiräte,* with the task of enhancing the quality of the built environment. Moreover, the TV series *plus/minus* (1985-1992) showing architecture criticism helped mainstreaming the public discourse on architecture (Grabher 2018, p. 5, Gauzin-Müller 2020, p. 143f.). The *Baukünstler* were involved in both, the design advisory boards and the TV series, and therefore definitely exerted change agency. Timber architecture got another boost in 1985, when the regional government founded the Energy Institute Vorarlberg in association with energy providers. This institution promotes environmentally friendly building products, reduced energy consumption, and the

use of renewable energies. Hence Vorarlberg became a frontrunner of the Passivhaus-approach (low energy building) (Dangel 2009, p. 278, Grabher 2018, p. 5).

In the 1990s, Vorarlberg's reputation as the province of timber construction was consolidated by three further key institutions, the *Vorarlberger Holzbaukunst* (founded in 1996), the Vorarlberg Institute for Architecture (founded in 1997) and the *Werkraum Bregenzwerwald* (founded in 1999), which also became bearers of system-level change agency. *Vorarlberger Holzbaukunst* was initiated by its current president. Despite being an outsider as a lawyer and employee of the chamber of commerce, he managed to push cooperation and regional value creation in the timber sector, thus developing system-level change agency. *Vorarlberger Holzbaukunst* today ensures collaboration between wood processing trades of the entire value chain. Its main activities are marketing, education and lobbying (Gauzin-Müller 2011, p. 228f.) and include events such as a prize for best timber buildings or open house days in timber houses. The Vorarlberg Institute for Architecture is an interface between planners, administration, clients and building companies (Grabher 2018, p. 5) and organizes exhibitions, conferences and visits of inspiring buildings (Gauzin-Müller 2020, p. 149). The *Werkraum Bregenzerwald* is another platform for marketing which promotes crafts and building culture located in the Bregenzerwald, a rural region with a long tradition of craftmanship. The association counts 95 member enterprises, organizes exhibitions, competitions and lectures and is engaged in recruiting young talents (Werkraum Bregenzerwald 2024).

During the 2000s, when Vorarlberg had long been a known destination for architectural tourists, timber architecture was further favored by the institutionalization of green building in policy instruments. This means that after system-level change agency was sparked by individual change agents – the *Baukünstler* – and carried on by institutions like the *Vorarlberger Holzbaukunst,* policy makers now got involved in change agency too and contributed to institutional change. In 2001, the province together with the Energy Institute Vorarlberg launched the Ecopass *(Ökologischer Gebäudeausweis)*, an ecological passport for construction. Homeowners/builders who fulfill the ecological criteria[5] of the Ecopass receive more subsidies (Gauzin-Müller 2020, p. 152). A similar instrument called *Kommunalgebäudeausweis* which assesses public buildings was introduced in 2011 (Energieinstitut Vorarlberg 2024). These instruments are motivated by increasing urban sprawl in the Rhine valley (Kapfinger 2003, p. 22) and accompanying sustainability concerns. The engagement of Vorarlberg's government in sustainability matters is also visible in other realms such as the program energy future *(Energiezukunft Vorarlberg)* which sets the goal of energy autonomy by 2050 (2007) (Gauzin-Müller 2020, p. 154), and Vorarlberg has today become a showcase for sustainable development at the regional level (ibid., p.146f.). The movement of the *Baukünstler* that started 60 years ago, contributed to making this happen.

In contrast to Vorarlberg, the Bern timber sector saw fewer change agents and little radically new ideas, and timber was a neglected building material for a long time. Although Switzerland, where traditional wooden houses dominate the mountainous parts, became famous for its prefabricated *Chalets* (wooden houses) in the 19th century (Sauter 2024, p. 135), it is only in recent decades that non-traditional (modern) timber architecture has become established (ibid., 133). While timber had been an important building material during the war period when other raw materials were unavailable (Adam 2023, p.

[5] The criteria of the Ecopass go beyond an energy label. They assess the energy source and heating consumption but also consider densification of the urban area, the application of bioclimatic measures, the choice of materials, the accessibility for people with reduced mobility, the presence of a bicycle park etc. (Gauzin-Müller 2020, p. 152)

155), the proportion of timber in Swiss buildings declined rapidly in the second half of the 20th century (Sauter 2024, p. 136). This trend could not be reversed by products like plywood and particle boards which were developed during the inter-war period and allowed modern architectural experiments (ibid.).

It took until the late 1980s and 1990s that the new developments of modern timber architecture in the neighboring country Austria swept into Switzerland. This was epitomized by the reintroduction of the national competition for timber architecture called *Prix Lignum* in 1999 which is now hold every third year (1st and 2nd editions 1932 and 1984) (Lignum Schweiz 2006). In 1997, the technical college for wood *(Holzfachschule)* in Biel, which was founded in 1952, integrated into the Bern University of Applied Sciences *(Berner Fachhochschule).* By that time, it had become a leading and world-renowned actor for wood-related research. After the 2000s, timber definitively started to be considered a modern building material in Switzerland (Sauter 2024, p. 133) and the nation-wide reform of fire protection regulations in 2005 facilitated the realization of pioneering multistory buildings (Wiederkehr 2014). These developments show system-level change agency targeting the national level.

It was only after 2010 that several initiatives started in the Canton of Bern to strengthen cooperation in the timber sector and to value the past and re-emerging timber building culture. Two change agents, an ambitious timber engineer and a member of government, exerted system-level change agency when they started the project *Aktion Wald und Holz* in 2014 with the support of the Cantonal administration. This project led to the founding of the industry association *Initiative Holz BE* in 2018 (Lignum Bern 2017). The latter became a sub-section of the national association of woodworking professions *Lignum* in 2021 and promotes innovation and cooperation (Initiative Holz BE 2020). One activity of this new institution, which indicates change agency, is the organization of a bi-annual networking event called *Brünig Forum Holz & Wirtschaft*. In 2020, another institution, the Bern University of Applied Sciences (School of Architecture, Wood and Civil Engineering) demonstrated system-level change agency by introducing the subject of timber construction culture in its curriculum (Sauter 2024).

Today, the importance of timber as resource and timber architecture is rapidly growing, and Swiss woodcraft, supported by technological advances of leading research organizations such as the Bern University of Applied Sciences and the two national research institutes ETH and EMPA in the Canton of Zurich, play a leading role. Moreover, two national research programs, one running between 2012 and 2016 on the use and availability of wood (NFP66) and one starting in 2025 on building culture (NFP81), underscore the growing interest in timber and building culture in Switzerland. In the Canton of Bern, however, we only identified minor system-level change agency from which only one major new institution (Lignum Bern) emerged. Individual change agents could not develop as much impetus as in Vorarlberg and institutional and policy actors drove less changes. Compared to Vorarlberg, the Bern timber sector was less successful in making sustainability concerns such as green building a publicly discussed topic.

In summary, we found that individual change agents were key drivers of system-level change agency because they initiated change processes: In our case studies, change agents created momentum which then led institutional actors and policy representatives to start developing system-level change agency too. Hence, we identified individuals, institutions and policy actors exerting system-level change agency. We moreover observed that extra-regional connections and their ability to initiate new networks for collaboration were important characteristics of successful change agents. Members of the *Baukünstler* movement, for example, grew up in Vorarlberg, learned a trade but then left the province

for their studies. Back home they profited from their insider knowledge but at the same time introduced progressive ideas from "outside" (cf. Grabher 2018, p. 4). As a lawyer, the president of *Vorarlberger Holzbaukunst* also came to the timber sector as an outsider who managed to network with long-standing entrepreneurs in the sector. Finally, we retain that the ability of change agents to provoke system-level change agency may also be time-specific and depend on the regional socio-economic institutional and cultural context.

5.2 Identified RIS elements enhancing challenge orientation

A glance at the current structure of the different RISs indicates that the two regions are at different stages of RIS reconfiguration. In Vorarlberg, we observe many new RIS elements that consciously target challenge orientation. In contrast, there are few in Bern (see Figure 4 and Table 4). We conclude that Vorarlberg has managed to build a CORIS while Bern is in the very beginning of the process. At the point of our research, the outcome of the Bernese process is uncertain. In what follows, we discuss RIS elements, that are, actors, networks and institutions, in more detail.

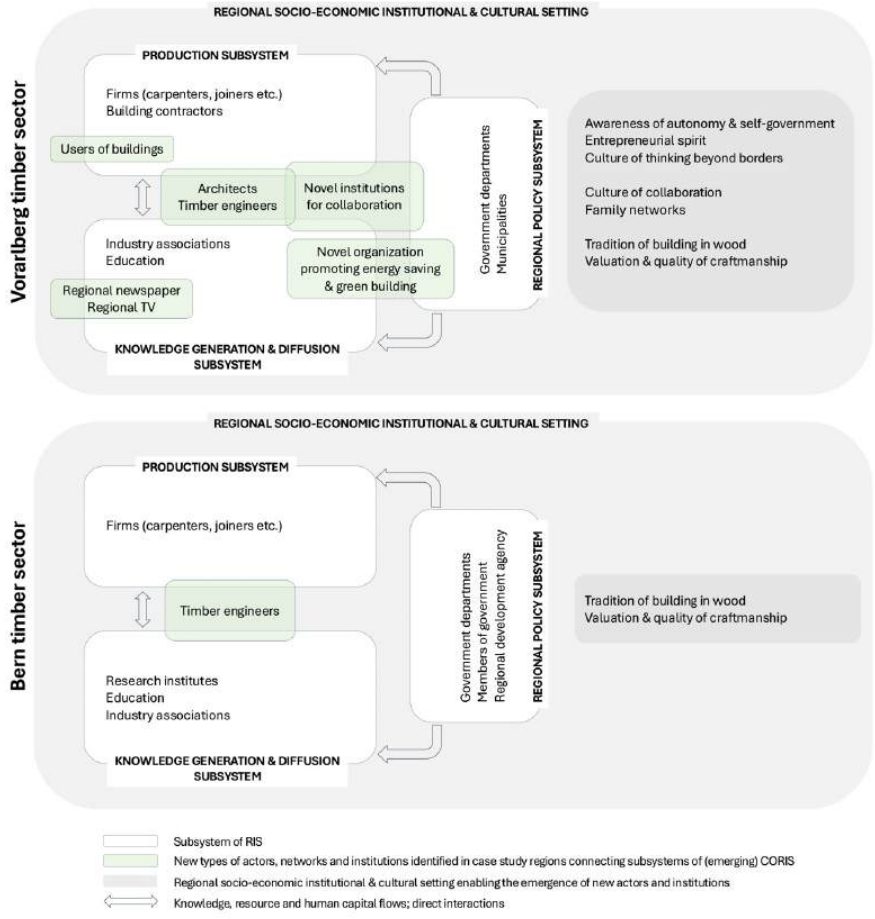


Figure 4: Comparison of RIS elements enhancing challenge orientation in case study regions.

In our case studies, we detected traditional RIS actors like public sector actors and firms but also new types of actors who respond to challenges of the timber sector. Public sector actors encompass several government departments responsible for the timber sector, building and sustainability. Interestingly, involved public sector actors seem more numerous in Vorarlberg, which we explain by the fact that the topic of green building and regional value creation has long been part of the political discourse. Innovative firms developed new building solutions (e.g. timber frame construction) in both regions, which increased efficiency and speed and hence contributed to making timber construction more competitive. In Bern, firms cooperated with the Bern University of Applied Sciences (I-1, BE) while in the Vorarlberg case, this was done together with resourceful building contractors and novel RIS actors: future users of the buildings, architects from the *Baukünstler* movement and timber engineers. In the early years of the *Baukünstler* movement, future users of buildings frequently participated in the construction process. Engaged timber engineers were also involved in developing and promoting timber construction practices (I-24, VA). Other novel actors who pushed challenge orientation of the Vorarlberg RIS are the president and initiator of *Vorarlberger Holzbaukunst*, the regional TV and the regional newspaper. Beside the TV series *plus/minus* (1985-1992) mentioned above (Gauzin-Müller 2011, p. 14), the regional newspaper frequently takes up the topics of forest, wood and architecture (including a supplement brochure documenting the price for best timber buildings). The TV and newspaper have contributed to change people's attitudes and hence promote the recognition and acceptance of challenge orientation in the broader public (I-14, VA; I-15, VA). Novel RIS actors are less frequent in Bern, where we only identified one timber engineer, the co-initiator of the industry association *Lignum Bern.*

Our research illustrates that networks seem to be decisive for increasing challenge orientation of a RIS because they foster collaboration across the sub-systems of a RIS and function as multipliers of system-level change agency. In Bern, there are few networks, and these are mostly dominated by traditional RIS actors. An example is the industry association *Lignum Bern*. In Vorarlberg, networks in the timber sector are numerous: *Vorarlberger Holzbaukunst* and *Werkraum Bregenzerwald* for example are networks which encompass the entire wood value chain and include other actors from adjoining sectors such as architects and craftswomen. These two networks reinforced what has already been strong in Vorarlberg, namely collaboration and communication on an equal footing between trades (I-15, VA). In addition, several smaller networks, for example *Faktor 8*, a collaboration of joineries promoting ecological and social sustainability (Faktor 8 2024), were founded to tackle challenges of the timber sector.

Challenge orientation can also be enhanced by new institutions. These are less numerous in Bern, where we only identified two (label for Swiss wood and *Prix Lignum*). In Vorarlberg, the first institution emerged in 1985 with the foundation of the Vorarlberg Energy Institute by the regional government. Other key institutions such as the Vorarlberg Institute for Architecture (1992) and the design advisory boards (1992) followed. Events like the prize for best timber buildings, the open house day or the introduction of labels for regionally sourced wood *(Bergholz, Holz von Hier)* also represent new institutions that address the challenge of green building and regional value creation. Since 2001, architects and planners can use a database with ecological building materials called *baubook*. The policy of the Ecopass, which ties subsidies for building to ecological criteria (introduced 2003/2011), was often mentioned as an important driver of green building (e.g., I-14, VA).

Our research shows that the identified RIS elements are embedded in a specific socio-economic and institutional context that heavily influenced their emergence and functioning. Depending on this context, RIS reconfiguration can succeed or fail. Vorarlberg's success was supported by its population's high awareness of autonomy and self-government (Kapfinger 2003, p. 21). Moreover, Vorarlberg entrepreneurs are said to have an affinity for risk and a strong entrepreneurial spirit (I-24, VA), which seems to be nurtured by a culture of thinking beyond borders (Vorarlberg is positioned in a cross-border region) (I-23, VA). Collaboration is also highly valued in Vorarlberg (I-15, VA) and facilitated by the strong family networks in the small province (I-22, VA). Finally, high regards for craftmanship and quality, which is tied to Vorarlberg's long tradition of building in wood, also enabled the transformations initiated by the *Baukünstler* movement (I-22, VA).

Table 4: Identified RIS elements enhancing challenge orientation in the two study regions (own compilation based on Tödtling et al. 2021, p.6-7).

RIS element enhancing challenge orientation	**Manifestation in the Vorarlberg timber sector**	**Manifestation in the Bernese timber sector**
Diverse types of **actors**, e.g.: • Civil society • Public sector • Users • Others Note: Important **change agents** are marked with a *****	Firms: • Sawmills, carpenters, joiners • Timber engineering • **Architecture *(Baukünstler)**** Public sector actors: • Landwirtschaftskammer • Abteilung Wohnbauförderung • Abteilung Raumplanung und Baurecht • Wirtschaftskammer Vorarlberg (mandatory membership for enterprises) • Municipalities & design advisory boards *(Gestaltungsbeiräte)* Users: • Building contractors / future users Other actors: • **President of *Vorarlbrger Holzbaukunst**** • Regional newspaper Vorarlberg • Regional TV Vorarlberg	Firms: • Sawmills, carpenters, joiners • Timber engineering Public sector actors: • Amt für Wald & Naturgefahren Research & higher education: • Bern University of Applied Sciences, School of Architecture, Wood and Civil Engineering Other actors: • **Co-founder of Lignum Bern*** (industry association) • **Member of government**
Diverse types of **networks**: • Encompass diverse actors • Multiscalar • Dynamically developing	• *Vorarlberger Holzbaukunst*[++] • *Werkraum Bregenzerwald*[++] • *Faktor 8* (collaboration of joiners) [++] • *Venstermacher* (collaboration of window manufacturers) [++] • *Tischler Rohstoffe*[++] • *Unternehmensplattform Traumhaus-Althaus* [++] • Carpenters & joiners' informal network	• Lignum Bern (industry association, incl. regional groups)[++]
Novel formal **institutions** with the purpose to promote challenge orientation Note: the networks in line 2 which are marked with a [++] are institutionalized and could also count as new institutions	• Vorarlberg Energy Institute *(Vorarlberger Energieinstitut) (1985)* • Vorarlberg Institute for Architecture *(Vorarlberger Architekturinstitut) (1992)* • Design advisory boards in municipalities *(Gestaltungsbeiräte)* (1992) • Price for timber buildings *(Vorarlberger Holzbaupreis) (1997)* • Label *Bergholz* (label for mountain wood in the region Grosses Walsertal) (2000) • Open house day in timber houses *(kumm ga luega)* (2008) • Ecopass *(Ökologischer/kommunaler Gebäudeausweis) (2003 / 2011)* • Baubook (online platform for ecological building) (2001) • Label *Holz von Hier* (for regionally sourced wood) (2019)	• Label Schweizer Holz (for Swiss wood) (1999) • Prix Lignum (since 1999 every third years)

In closing, we retain that the new types of actors and networks identified (summary in Table 4) connect the three sub-systems of the RIS (production, knowledge generation/diffusion and policy) (cf. Figure 4). In this connection may lay much power to enhance challenge orientation of a RIS.

6 Discussion and conclusion

To explore the different paths of RIS reconfiguration in the Vorarlberg and Bern timber sectors, we asked what RIS elements enhance challenge orientation and who exerts system-level change agency. Our results indicate that individual change agents, which are locally rooted but possess extra-regional connections and have networking skills, are key bearers of system-level change agency and can drive RIS reconfiguration. Institutions and policy actors may also develop change agency due to the dynamics created by individual change agents. Regarding the RIS elements enhancing challenge-orientation, we found that new types of actors, networks and institutions which connect the three sub-systems of the RIS seem particularly powerful. Additionally, we saw that the local socio-economic context must be considered in the explanation of RIS reconfiguration. Overall, the results suggest that together with resourceful change agents, systemic factors like a favorable policy landscape and a supportive socio-economic context are key enablers of RIS reconfiguration. Further, the case study indicates that RIS reconfiguration is a complex process that needs much more than technological solutions.

This study adds empirical knowledge to the emerging literature on CORIS. Our research contributes to a better understanding of systemic factors enabling RIS reconfiguration and, at the same time, demonstrates the importance of resourceful change agents who exert system-level change agency. *First,* and as regards systemic factors, our results indicate that policies for sustainable development are crucial for advancing CORIS initiatives. This aligns with Tödtling *et al*. (2021) who describe the CORIS initiative *VLOTTE* in Vorarlberg, which is geared towards sustainable e-mobility. They show that the region's strategic goals and visions regarding sustainable transformation in the energy and mobility sector were a main condition for the emergence of this initiative (p. 13). Other CORIS research like the empirical study of the German building sector (Campos Mühlenhoff & Herzig 2024) equally indicate the need of supportive policies at the supra-regional level (p. 8). Besides supportive policies, 'soft' contextual factors are decisive for successful CORIS initiatives but difficult to tackle – a fact also acknowledged by other CORIS studies (Fromhold-Eisebith 2024, p. 646). In our case, three peculiarities – a region`s remoteness from the political center (Grabher 2018), the smallness of the territory (everyone knows everyone) and the structure of the timber sector with a high density of family-owned SMEs (Dallere & Tempestini 2024, p. 29f.) – created a socio-cultural environment in which room for experiments was possible. *Second*, our study showed that change agents who take this room are needed for RIS reconfiguration. These findings are in line with Grillitsch et al. (2024) who stress the importance of resourceful individuals who can draw on their experiences, skills and networks (p. 14) for driving change. We recognize that the specific histories of RIS reconfiguration we described cannot be duplicated, but the CORIS concept is useful for identifying its components.

Our paper also opens new questions. The types of innovation leading to the formation of new networks and institutions in a CORIS should be further investigated. A first step towards this goal is to identify RIS elements which enhance challenge orientation. We assume that in our case, social, institutional and other innovations played out in the formation of networks like *Vorarlberger Holzbaukunst* or the Vorarlberg Energy Institute. More research is needed to understand the institutional structures and dynamics that support or hinder sustainability transformations (Binz & Castaldi 2024, pp. 3, 5). In our research, formal institutions, particularly policy contexts like building laws and policies for sustainable development seemed to enhance Vorarlberg's challenge orientation. Their role could be further investigated, expanding the range to national and supranational levels, which influence regional

challenge-oriented initiatives (Tödtling *et al.* 2021, p. 12f.). The impact of the regional socio-economic context on challenge-oriented initiatives deserves more attention too. Further, the question why regions lack challenge orientation could be explored more deeply (Baumgartinger-Seiringer 2022, Eder & Döringer 2022, Steinböck & Trippl 2023). Finally, reflections on the positive and negative effects of innovation should be deepened (Binz & Castaldi 2024, p. 4). In Vorarlberg, for example, the timber sector may drive the already heavy urban sprawl (Gauzin-Müller 2020, p. 148) by promoting building projects. Despite many open questions, we believe that our research indicates ways forward for the timber sector to address sustainability challenges which could ultimately stimulate regional development.

Research ethics and consent statement

This manuscript includes interview data. The interview participants provided oral consent for the recording of the interviews and gave permission for the information gathered to be used for this study and any subsequent publications. Ethical approval of the study by the University of Bern was not required because our research did not involve any potentially unethical and/or adverse effects for the participants involved. Our research was set up to respect the fundamental values of dignity, liberty and health, and complied with the legal provisions stipulated by the Statutes of the University of Bern. The research was designed to ensure that it did not threaten the physical or mental integrity, the right to privacy, other subjective rights or prevailing interests of participants. Adequate protection of the rights, safety and welfare of the participants was ensured during the implementation of the research project.

7 References

ADAM, H. 2023. *Touch Wood. Material, Architecture, Future.* Ferrer, C., Hildebrand, T. & Martinez-Cañavate, C., *eds.* Zürich: Lars Müller Publishers, 151–163 pp.

ASHEIM, B.T., ISAKSEN, A. & TRIPPL, M. 2019. *Advanced Introduction to Regional Innovation Systems*. Cheltenham,Northampton: EdwardElgar.

BAUMGARTINGER-SEIRINGER, S. 2022. The role of powerful incumbent firms: shaping regional industrial path development through change and maintenance agency. *Regional Studies, Regional Science*, **9**, 390–408, 10.1080/21681376.2022.2081597.

BÉLIS-BERGOUIGNAN, M.-C. & LEVY, R. 2010. Sharing a common resource in a sustainable development context: The case of a wood innovation system. *Technological Forecasting and Social Change*, **77**, 1126–1138, 10.1016/j.techfore.2010.03.009.

BERNER FACHHOCHSCHULE, D.A.H. UND B. 2024. HOLZBAUKULTUR Available at: https://www.holzbaukultur.ch/de/bueros/ [Accessed November 12, 2024].

BINZ, C. & CASTALDI, C. 2024. Toward a normative turn in research on the geography of innovation? Evolving perspectives on innovation, institutions, and human well-being. *Progress in Economic Geography*, **2**, 100018, 10.1016/j.peg.2024.100018.

BLAIR, M.J., CABRAL, L. & MABEE, W.E. 2017. Biorefinery strategies: exploring approaches to developing forest-based biorefinery activities in British Columbia and Ontario, Canada. *Technology Analysis and Strategic Management*, **29**, 528–541, 10.1080/09537325.2016.1211266.

BOGERS, M., AFUAH, A. & BASTIAN, B. 2010. Users as innovators: A review, critique, and future research directions. *Journal of Management*, **36**, 857–875, 10.1177/0149206309353944.

BUNDESAMT FÜR UMWELT BAFU. 2022. *Jahrbuch Wald und Holz 2022*. Bern, 1–108 pp.

CAMPOS MÜHLENHOFF, S. & HERZIG, C. 2024. Challenge-oriented Development in a Regional Innovation Network: A Case Study from the State of Hesse in Germany. *Advance in Sustainability*, **4**, 1–11, 10.26855/as.2024.03.001.

CANEPARO, L. & DALLERE, C. 2024. Architecture and local resources: project experiences in Vorarlberg. *Archalp*, **12**, 37–65, 10.30682/aa2412f.

CHLEBNA, C., EVENHUIS, E. & MORALES, D. 2024. Economic geography and planetary boundaries: Embracing the planet's uncompromising call to action. *Progress in Economic Geography*, **2**, 100021, 10.1016/j.peg.2024.100021.

DALLERE, C. & TEMPESTINI, M. 2024. Vergangenheit und Zukunft des Holzbaus. Interview mit Hermann Kaufmann. *Archalp*, **12**, 27–31, 10.30682/aa2412e.

DANGEL, U. 2009. Material Regionalism: Vorarlberg's Sustainable Timber Construction Tradition. *In 97th ACSAAnnual Meeting Proceedings, The Value of Design*. 271–278. Available at: https://www.acsa-arch.org/proceedings/Annual%20Meeting%20Proceedings/ACSA.AM.97/ACSA.AM.97.34.pdf [Accessed July 30, 2024].

DREXEL, C. 2023. *Brennholz in Vorarlberg: Analyse der Stoff- und Energieströme; strategische Grundlagen und mögliche Massnahmen*. Bregenz, 1–15 pp. Available at: https://vorarlberg.at/documents/302033/472360/drexel%20reduziert%20GmbH%202023_Brennholzstudie.pdf/fb6464cc-d3ec-fe58-fb07-c3e2b623df91?t=1708532989041 [Accessed September 20, 2024].

562 EDER, J. & DÖRINGER, S. 2022. The Limits of Change Agency: Establishing a Peripheral University
563 Campus in East Tyrol. *Local Economy*, **37**, 297–316, 10.1177/02690942221122100.
564 ENERGIEINSTITUT VORARLBERG. 2024. Der Kommunalgebäudeausweis - KGA Available at:
565 https://www.energieinstitut.at/unternehmen/bauen-und-sanieren-fuer-
566 profis/gebaeudezertifizierung-und-evaluierung/der-kommunalgebaeudeausweis [Accessed
567 October 2, 2024].
568 EUROPEAN COMMISSION. 2018. *A sustainable bioeconomy for Europe: strengthening the connection*
569 *between economy, society and the environment. Updated bioeconomy strategy*. Brussels, 1–107
570 pp.
571 FACHVERBAND HOLZINDUSTRIE ÖSTERREICH FVHI. 2023. *Branchenbericht 2022/2023*. Wien
572 Available at: https://www.holzindustrie.at/infothek/publikationen/ [Accessed February 13, 2024].
573 FAKTOR 8. 2024. Faktor 8. Tischler, die neue Wege gehen. Available at: https://faktor8.at/ueber-uns/
574 [Accessed November 13, 2023].
575 FINANZVERWALTUNG KANTON BERN. 2023. Kennzahlen Kanton Bern 2022 Available at:
576 https://www.fin.be.ch/de/start/themen/OeffentlicheStatistik/kennzahlen-und-portraets.html
577 [Accessed August 20, 2024].
578 FORSTWESEN VORARLBERG. 2021. *Vorarlberger Waldstrategie 2030+*. Bregenz Available at:
579 www.vorarlberg.at/land-forstwirtschaft.
580 FROMHOLD-EISEBITH, M. 2024. How can a regional innovation system meet circular economy
581 challenges? Conceptualization and empirical insights from Germany. *Cambridge Journal of*
582 *Regions, Economy and Society*, **17**, 637–648, 10.1093/cjres/rsae024.
583 GAUZIN-MÜLLER, D. 2011. *Ökologische Architektur in Vorarlberg. Ein soziales, ökonomisches und*
584 *kulturelles Modell.* Wien & New York: Springer-Verlag.
585 GAUZIN-MÜLLER, D. 2020. The Ecological Transition of Vorarlberg and Its Implementation in France.
586 *In* Fanfani, D. & Mataran Ruiz, A., *eds. Bioregional Planning and Design: Volume II. Issues and*
587 *Practices for a Bioregional Regeneration a* . Cham: Springer International Publishing, 141–155.,
588 10.1007/978-3-030-46083-9_8.
589 GRABHER, G. 2018. Marginality as strategy: Leveraging peripherality for creativity. *Environment and*
590 *Planning A*, **50**, 1785–1794, 10.1177/0308518X18784021.
591 GRILLITSCH, M., REKERS, J., ASHEIM, B., FITJAR, R.D., HAUS-REVE, S., KOLEHMAINEN, J., KURIKKA,
592 H., et al. 2024. Patterns of opportunity spaces and agency across regional contexts: Conditions and
593 drivers for change. *Environment and Planning A: Economy and Space*,
594 10.1177/0308518X241303636.
595 HARGRAVE, T.J. & VAN DE VEN, A.H. 2006. A collective action model of institutional innovation.
596 *Academy of Management Review*, **31**, 864–888.
597 INITIATIVE HOLZ BE. 2020. Initiative Holz BE Jahresbericht 2019, 1–15 pp. Available at:
598 https://lignumbern.ch/wp-content/uploads/2020/03/Jahresbericht-Initiative-Holz-Bern-2019.pdf
599 [Accessed October 7, 2024].
600 ISAKSEN, A., TRIPPL, M. & MAYER, H. 2022. Regional innovation systems in an era of grand societal
601 challenges: reorientation versus transformation. *European Planning Studies*, 1–14,
602 10.1080/09654313.2022.2084226.

603 JOLLY, S., GRILLITSCH, M. & HANSEN, T. 2020. Agency and actors in regional industrial path
604 development. A framework and longitudinal analysis. *Geoforum*, **111**, 176–188,
605 10.1016/j.geoforum.2020.02.013.
606 KAPFINGER, O. 2003. *Konstruktive Provokation. Neues Bauen in Vorarlberg.* Vorarlberger
607 Architekturinstitut.
608 KLEISSNER, A. 2021. Bedeutung der Forst-und Holzwirtschaft für Österreichs Wirtschaft Available at:
609 https://www.wko.at/oe/oesterreich/2021-03.
610 KNECHT, T. 2023. Bevölkerung Available at: www.vorarlberg.at/statistik [Accessed August 20, 2024].
611 KUBECZKO, K., RAMETSTEINER, E. & WEISS, G. 2006. The role of sectoral and regional innovation
612 systems in supporting innovations in forestry. *Forest Policy and Economics*, **8**, 704–715,
613 10.1016/j.forpol.2005.06.011.
614 LEHNER, L., PAULI, B., WEIDNER, U. & BURKHARDT, A. 2003. Struktur- und Potenzialanalyse der
615 Schweizer Sägeindustrie. Abschlussbericht, 1–243 pp.
616 LIGNUM BERN. 2017. Gründung Initiative Holz Available at: https://lignumbern.ch/gruendung-
617 initiative-holz/ [Accessed December 11, 2024].
618 LIGNUM SCHWEIZ. 2006. Lignum Journal. Newsletter Lignum Holzwirtschaft Schweiz Frühjahr 2006.
619 1–4 Available at:
620 https://www.lignum.ch/files/_migrated/content_uploads/75_Jahre_Lignum_1931-2006.pdf
621 [Accessed October 7, 2024].
622 LÜTHI, T. 2021. *Branchenspiegel Wal- und Holzwirtschaft Kanton Bern Ausgabe 2020/21*. Spiez, 1–19
623 pp. Available at: https://lignumbern.ch/wp-content/uploads/2021/07/2021.03.22-
624 Final_PDF_quer_Branchenspiegel_InitiativeHolzBE.pdf [Accessed September 20, 2024].
625 MARTIN, H., GRUNDEL, I. & DAHLSTRÖM, M. 2023. Reconsidering actor roles in regional innovation
626 systems: transformative industrial change in the forest-based bioeconomy. *Regional Studies*,
627 10.1080/00343404.2022.2151581.
628 MAYRING, P. & FENZL, T. 2019. Qualitative Inhaltsanalyse. *In* Baur, N. & Blasius, J., *eds. Handbuch*
629 *Methoden der empirischen Sozialforschung*. Wiesbaden: Springer Fachmedien Wiesbaden, 633–
630 648., 10.1007/978-3-658-21308-4.
631 MITTERLECHNER, T. & WEBER, H. 2022. Vorarlberg in Zahlen. Ausgabe 2022 Available at:
632 https://www.wko.at/vlbg/zahlen-daten-fakten/zahlen-daten-fakten-vorarlberg [Accessed August
633 20, 2024].
634 NILSEN, T., CALIGNANO, G., LIEN, S. & NORDLI, A.J. 2024. Norwegian wood, isn't it good? Narratives
635 of the lumber industry and development paths in the Nordic periphery. *Journal of Rural Studies*,
636 **105**, 103182, 10.1016/j.jrurstud.2023.103182.
637 OECD. 2024. Monthly comparative price levels. *OECD Data Explorer* Available at: https://data-
638 explorer.oecd.org/vis?tm=monthly%20comparative%20price%20levels&pg=0&snb=3&vw=ov
639 &df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_PPP_M%40DF_PP_CPL_M&df[ag]=OECD.S
640 DD.TPS&df[vs]=1.0&dq=CHE%2BAUT.M....&to[TIME_PERIOD]=false&pd=2024-09%2C
641 [Accessed November 13, 2024].
642 PAULI-KRAFFT, U., SUTER, C.-L. & AEBISCHER, C. 2021. Ressourcenpolitik Holz 2030. Strategie, Ziele
643 und Aktionsplan Holz 2021 - 2026. *Umwelt-Info Nr. 2103* Available at: www.bafu.admin.ch/ui-
644 2103-d [Accessed October 3, 2023].

PURKUS, A., HAGEMANN, N., BEDTKE, N. & GAWEL, E. 2018. Towards a sustainable innovation system for the German wood-based bioeconomy: Implications for policy design. *Journal of Cleaner Production*, **172**, 3955–3968, 10.1016/j.jclepro.2017.04.146.

RAFFAELLI, R. & GLYNN, M.A. 2015. Institutional Innovation: novel, useful, and legitimate. *In* Zhou, J., *ed. The Oxford Handbook of Creativity, Innovation, and Entrepreneurship*. OxfordUniversityPress.

REGIONALENTWICKLUNG VORARLBERG EGEN & TELESIS GMBH. 2018. Holzcluster Vorarlberg. Regionaler Clusterstudienbericht Available at: http://data.regio-v.at/CaSCo/DT411-CaSCo_Regio-V_clusterstudyreport_final.pdf [Accessed February 5, 2024].

RÜCKER, E., KRAMMER, D., HOCH, I., PAUL, S., MATHIS, T., TOMASELLI, K., MARLIN, A., HAGSPIEL, E., KORIZEK, C. & LITMEYER, M.-L. 2018. Strukturdaten Vorarlberg 2018 Available at: https://vorarlberg.at/documents/302033/472382/Strukturdaten2018.pdf/170ce4ac-0743-f82f-366f-75d2628165cc?t=1616165007849 [Accessed August 20, 2024].

SAUTER, M. 2024. Was kennzeichnet einen Holzbau? *Archalp*, **12**, 133–139, 10.30682/aa2412q.

STATISTA. 2024. Bruttoinlandprodukt (BIP) pro Kopf in Vorarlberg von 2012 bis 2022 Available at: https://de.statista.com/statistik/daten/studie/1270719/umfrage/bruttoinlandsprodukt-bip-pro-kopf-in-vorarlberg/ [Accessed September 20, 2024].

STEINBÖCK, N. & TRIPPL, M. 2023. The thorny road towards green path development: the case of bioplastics in Lower Austria. *Regional Studies, Regional Science*, **10**, 735–749, 10.1080/21681376.2023.2244572.

TÖDTLING, F. & TRIPPL, M. 2005. One size fits all? Towards a differentiated regional innovation policy approach. *Research Policy*, **34**, 1203–1219, 10.1016/j.respol.2005.01.018.

TÖDTLING, F., TRIPPL, M. & DESCH, V. 2021. New directions for RIS studies and policies in the face of grand societal challenges. *European Planning Studies*, **0**, 1–18, 10.1080/09654313.2021.1951177.

TRIPPL, M. 2023. Challenge-oriented regional innovation systems and strategies for sustainability transitions. *In* Schwaag Serger, S., Soete, L. & Stierna, J., *eds. The Square: Putting place-based innovation policy for sustainability at the center of policymaking*. European Commission Joint Research Centre., 10.2760/575800.

TRIPPL, M., BAUMGARTINGER-SEIRINGER, S. & KASTRUP, J. 2024a. Challenge-oriented regional innovation systems: towards a research agenda. *Investigaciones Regionales - Journal of Regional Research*.

TRIPPL, M., FASTENRATH, S. & ISAKSEN, A. 2024b. Rethinking regional economic resilience: Preconditions and processes shaping transformative resilience. *European Urban and Regional Studies*, **31**, 101–115, 10.1177/09697764231172326.

TSCHUMI, P., WINIGER, A., WIRTH, S., MAYER, H. & SEIDL, I. 2020. Wachstumsunabhängigkeit durch Soziale Innovationen? Eine Analyse potenzieller Wachstumswirkungen von Sozialen Innovationen im Schweizer Berggebiet. *In* Lange, B., Hülz, M., Schmid, B. & Schulz, C., *eds. Postwachstumsgeographien. Raumbezüge diverser und alternativer Ökonomien.* Bielefeld: transcript Verlag, 117–137., 10.14361/9783839451809.

VON HIPPEL, E. 2016. User Innovation. *In The Palgrave Encyclopedia of Strategic Management*. Palgrave Macmillan UK, 1–6., 10.1057/978-1-349-94848-2_380-1.

687 WERKRAUM BREGENZERWALD. 2024. Werkraum Bregenzerwald Available at:
688 https://www.werkraum.at/der-verein [Accessed October 2, 2024].
689 WIEDERKEHR, R. 2014. Brandschutz im Holzbau - Die Schweiz setzt Massstäbe Available at:
690 https://events.forum-holzbau.com/pdf/38_IHF_2014_Wiederkehr.pdf [Accessed October 7,
691 2024].
692

III. CONCLUSIONS

8 Synthesis of findings

This chapter synthesizes the findings of this dissertation. It starts with an overview of the main results of the three presented research articles in chapter 8.1 and then discusses three overarching topics which emerged from the dissertation: Chapter 8.2 reviews the transformative potential of SMEs, chapter 8.3 illuminates the transformative potential of the timber sector and chapter 8.4 explores drivers and barriers of sustainability transformation.

8.1 Main findings of the research articles

Table 3 summarizes the main findings of the three research articles presented in this dissertation.

Table 3: Main findings of research articles.

Article number and title	Research questions	Main findings
1 – Transformative enterprises: Characteristics and a definition	• What operationalizable characteristics that refer to transformative enterprises are discussed in the literature? • How can we define transformative enterprises?	This research article develops a definition of transformative enterprises. It does so by identifying nine key dimensions of transformative enterprises and defining a set of 30 indicators for describing them. It is found that the characteristics of each key dimension can be attributed to either firm- or system-level agency. The concept of transformative enterprise offers a micro-perspective on economic actors and their agency: The nine key dimensions of transformative enterprises presented in this article describe how SMEs may exert firm-level and system-level agency. The findings show that firm-level and system-level agency can go beyond technological innovation and the greening of industries.
2 – Transformative firm-level agency: A case study of small and medium-sized enterprises (SMEs) in the Swiss wood-processing industry	• What characteristics and micro-level practices define types of potential agents of transformative change in the wood-processing industry? • What is these SMEs' capacity to exert change agency regarding sustainability transformation?	Based on the concept of transformative enterprise, and drawing on a qualitative study with 24 wood-processing SMEs in the Bernese timber sector, this research article identifies five empirical enterprise types: silent ecologists, social pioneers, visionary nonconformists, ambitious entrepreneurs, and pragmatist traditionalists. Three main findings emerged from this article: *First*, the article finds that all enterprise types except the pragmatist traditionalists show many characteristics of transformative enterprises, which indicate transformative firm-level agency. However, only one enterprise type, the ambitious entrepreneur, seems capable of inducing changes at the system-level. This is due to several limits of change agency. *Second,* the article identifies limits of change agency which impede the work of potentially transformative SMEs. Micro and small SMEs that fit into the enterprise types of silent ecologist, social pioneer and visionary nonconformist face the most limits to change agency. *Third,* it is shown that depending on their agency, SME types take various and sometimes more than one actor roles: the article identifies innovative

		entrepreneurs, visionaries, critics, silent change makers and status quo keepers among the five enterprise types. The typification of potentially transformative SMEs sheds light on the heterogeneity of firms as change agents in the context of sustainability transformations: not only the "usual suspects", i.e. well-known sustainability pioneers, may promote sustainability transformation but little-recognized SMEs like the silent ecologist, the social pioneers, or the visionary nonconformists.
3 – How regional innovation systems (RIS) integrate sustainability challenges: RIS reconfiguration in the timber sector	• What elements (actors, networks, institutions) of the RIS around the Vorarlberg and Bernese timber sector enhance challenge orientation? • Who exerts system-level change agency and how does this agency manifest?	The article compares the regional innovation system (RIS) of the timber sector in Bern (CH) to that of Vorarlberg (AUT), and by doing so illuminates the process of RIS reconfiguration, i.e. how RISs integrate sustainability challenges and eventually become a challenge-oriented regional innovation system (CORIS). Drawing on the concept of challenge-oriented regional innovation system, the article identifies actors, networks and institutions which contribute to integrating sustainability challenges into the RIS. It moreover finds that individual change agents with extra-regional connections and networking capabilities are key bearers of system-level change agency. The comparative case study shows that Vorarlberg has managed to build a CORIS around its timber sector while Bern is in the very beginning of the process: in Vorarlberg system-level change agents were more successful in initiating new networks, which function as multipliers of change agency. Besides, the dynamics created by change agents also led to the formation of new institutions supporting challenge-orientation. The articles insights contribute to understanding transformation at a systemic level and illustrate how natural resource-based industries can pioneer sustainable futures.

8.2 The transformative potential of SMEs

A recurring topic in the first and second article of this dissertation is the **transformative potential** of **SMEs**. The insights gained from these articles thus provide answers to the first overarching research question, that is, *in what ways and to what extent can SMEs shape sustainability transformation?* In line with previous studies such as research on SMEs in low carbon transitions (North 2016, North & Nurse 2014), investigations on growth-neutral corporate management (e.g. Liesen *et al.* 2015, Zahrnt *et al.* 2013) or contributions discussing the role of enterprises in a 'Great Transformation'[36] (Schneidewind *et al.* 2012), this dissertation found that SMEs can indeed be regarded as important change agents in

[36] The notion of the Great Transformation was firs coined by Karly Polanyi in his 1944 Book *Great Transformation. The Political and Economic Origins of Our Time* (Polanyi 2001) and taken up almost seven decades later by the German Advisory Council on Global Change WBGU in their flagship report *World in Transition. A Social Contract for Sustainability* (WBGU 2011b).

sustainability transformation. In the following, I discuss the transformative potential of SMEs discovered in this thesis by referring to the broader literature on SMEs and sustainability transformation. More specifically, I illuminate what SME characteristics are conducive to sustainability transformation, show to what extent SMEs in the timber sector are a special case and – with a view on the key dimensions of transformative enterprises and the five SME types identified in this thesis – recapitulate how the transformative potential of SMEs can look like.

To find out why SMEs have transformative potential, a glance at the literature on SMEs and sustainability transformation is informative. This literature illustrates that some **characteristics prevalent in SMEs** make them more likely to comply with the characteristics of transformative enterprises identified in the first research article: the relative **smallness** of SMEs implies that they are less exposed to growth drivers (Posse 2015, p. 53), have lower environmental impact (Nesterova 2021, p. 4) and tend to show responsible management styles (Damian Wirth *et al.* 2023, p. 1). Besides that, **family ownership**, which is often coupled with owner-management, can positively affect management styles and fosters strong emotional attachment and loyalty between the enterprise and its employees (ibid., Maurer 2024, p. 48).

Three general SME characteristics in terms of their orientation towards business also favor their compliance with the key dimensions of transformative enterprises. *First*, SMEs often show a strong **value orientation** (Damian Wirth *et al.* 2023, p. 23), such that they orient their business along social, ecological or qualitative goals (e.g. in the case of crafts) instead of pursuing profit maximization (cf. Maurer 2017). *Second*, business activities in SMEs are mostly **long-term oriented** (Damian Wirth *et al.* 2023, p. 1). This fosters the stability of the enterprises and affects the relations with stakeholders, who are for example paid fair prices. *Third,* SMEs often have a **regional orientation** (ibid.), which can encourage their engagement for regional and societal issues and often helps reducing environmental impacts (e.g. through shorter transports). Finally, two characteristics regarding the ways SMEs do business enhance their compliance with characteristics of transformative enterprises: SMEs mostly pursue **specific objectives** (e.g. the regional provision with a product or service), which can lower growth drivers (Posse 2015, p. 71). Moreover, SMEs are also said to have a pronounced **competitive awareness** (Damian Wirth *et al.* 2023, p. 1). This may facilitate their positioning in market niches, where they pursue quality (e.g. long-lasting products, excellent services) instead of quantity (cf. Liesen *et al.* 2013, Liesen *et al.* 2015). These seven characteristics differentiate SMEs from large enterprises and support the transformative potential of SMEs[37]. Table 4 shows the nine key dimensions of transformative enterprises identified in the first research article and lists SME characteristics supporting them.

The research for this dissertation has shown that the above-mentioned general characteristics of SMEs that support the nine key dimensions of transformative enterprises can also be found in SMEs of the Swiss and Austrian **timber sector**. Small, family-owned SMEs are even the majority in the timber sector of the two regions, where empirical research for this dissertation was conducted. Two further features of SMEs in the timber sector may affect their compliance with the key dimensions of transformative enterprises: the fact that the examined SMEs are practicing a **craft** can influence their basic orientation towards work (Maurer 2024, p. 47, Posse 2015, p. 71). What is more, SMEs in the

[37] As described in chapter 9.2, this dissertation only focused on SMEs and the definition of transformative enterprises developed is specific for SMEs. Future research should, however, investigate to what extent big enterprises have transformative potential and in what ways this potential is different from SMEs.

timber sector process the **renewable resource wood**, which facilitates their alignment with the goal of low environmental pollution. Hence, transformative SMEs may be more common in the timber sector of the examined regions than in other sectors because of industry structures and characteristics.

Table 4: SME characteristics supporting key dimensions of transformative enterprises.

Key dimension	Indicators for key dimension	General SME characteristic(s) supporting key dimension
1 Driving Mission	1.1 Alternative goals 1.2 Idealism 1.3 Role model	Value orientation
2 Stability & autonomy	2.1 Sufficiency orientation 2.2 Long-term orientation 2.3 Autonomous management 2.4 Financial independence 2.5 Limits to growth	Smallness Long-term orientation Value orientation Pursuit of specific objectives
3 Ecological footprint	3.1 Low resource use 3.2 Low environmental pollution	Smallness Regional orientation
4 Social obligation	4.1 Care for employees 4.2 Social inclusiveness	Smallness Value orientation Regional orientation
5 Participatory governance	5.1 Participation 5.2 Flat hierarchies 5.3 Transparency 5.4 Alternative ownership 5.5 Knowledge exchange	Smallness Family ownership Value orientation
6 Alternative products & services	6.1 Niche markets 6.2 High quality 6.3 Repairable products 6.4 Service-orientation 6.5 Convivial innovation	Value orientation (e.g. craftmanship) Competitive awareness
7 People before profit	7.1 Low wage differentials 7.2 Fair prices 7.3 Profit redistribution	Family ownership Value orientation Long-term orientation Regional orientation
8 Regional embeddedness	8.1 Regionalization 8.2 Stakeholder proximity 8.3 Strong cooperation	Long-term orientation Regional orientation
9 Change agent	9.1 Initiative for value change 9.2 Initiative for industry change	Value orientation

The concrete ways in which SMEs can **promote sustainability transformation** are described by the nine key dimensions and corresponding indicators for transformative enterprises developed in the first part of this thesis (cf. chapter 5; Hug et al. 2022). SMEs have many options to increase sustainability through their **agency**, which leads to observable characteristics of transformative enterprises. **Firm-level agency** unfolds through various practices: SMEs can for example pursue financial independence (e.g. by using alternative financing models or regional currencies) or set limits to enterprise growth (in sales, production or employees). Lowering resource use and environmental pollution is another way to enhance enterprise sustainability. Further, SMEs can stress social obligations when they care for employees through providing meaningful work and excellent working conditions and engage for social inclusiveness (e.g., by training and employing disabled, disempowered or delinquent people). Sustainability transformation can also be supported by the implementation of participatory governance strategies such as extended possibilities for participation, flat hierarchies or transparency measures and alternative ownership structures. SMEs can moreover produce alternative products that fulfill high quality standards and are repairable or introduce product replacing services. Limiting wage differentials,

paying fair prices and redistributing profits (to employees, replacement investments or charity) is another way to achieve more sustainability within the enterprise. SMEs can also try to change the broader sectoral or regional context in which they operate by exerting **system-level agency**: they can implement strategies which foster regional embeddedness, such as the use of regional resources (natural and personnel), seeking stakeholder proximity and strong (regional) cooperation. Finally, SMEs may also try to advocate for changes towards sustainability and profound changes in values (towards sufficiency and economic activity within planetary boundaries) at the industry or regional level.

As the results of the second research article indicate, the degree to which SMEs fulfill the nine key dimensions of transformative enterprises defines their **transformative potential** (cf. chapter 6 ; Hug et al. 2024). The latter varies between the five SME types we introduced. In the case of the silent ecologists, the social pioneers and the visionary nonconformists the transformative potential mainly concerns the firm level: silent ecologists can showcase ecological sustainability, social pioneers promote inclusiveness, and visionary nonconformists show how 'doing things differently is possible'. Ambitious entrepreneurs have the potential to induce changes at the industry or regional level by exerting system-level agency. Meanwhile, it was found that pragmatist traditionalists show little transformative potential except for the general SME characteristics prevalent in the timber sector.

While firm attributes like size or position in a network can influence the transformative potential (see chapter 8.4), the latter is also impacted by the enterprise's **motivations** for pursuing strategies of transformative enterprises. Strongly transformative enterprises like the silent ecologists, social pioneers or visionary nonconformists pursue **ecological or social values**, which are their motivation for doing business (innermost circle in Figure 3). Those three SME types therefore have more potential to engage for value changes. However, and as exemplified in the SME type of ambitious entrepreneur, strategies and relations with stakeholders, which were identified as a key dimension of transformative enterprises, may also be pursued for **other motivations** than purely ecological or social ones. Indeed, the literature on SMEs and sustainability transformation tells us that economic factors like the quality of products, services and corporate culture (Bocken & Short 2016), resilience (Palzkill & Augenstein 2017) or employee satisfaction (Maurer 2024, p. 46) as well as individual inclinations (that need not be justified ecologically or economically) can equally lead to the adoption of business strategies seen in transformative enterprises (ibid.). The pursuit of craftmanship, i.e. being devoted to work for one's own sake, can be one such individual inclination (Maurer 2024, p. 47). Hence, the transformative potential of SMEs motivated by other than purely social or ecological values does not encompass the triggering of profound changes in values but can nevertheless be substantial (cf. Walley & Taylor 2002, p. 33).

In **summary**, the *ways* in which SMEs can shape sustainability transformation are described by the nine key dimensions and corresponding indicators for transformative enterprises. While SMEs can implement many strategies targeting sustainability transformation within their own organization, thus exerting firm-level agency, they may also try to influence stakeholders and the sectoral and regional context in which they operate (system-level agency). The *extent* to which SMEs can shape sustainability transformations varies between types of potentially transformative enterprises. Among the types identified in the second research article of this dissertation only the ambitious entrepreneurs showed substantial system-level agency. Transformative potential was also identified in the silent ecologists, the social pioneers and the visionary nonconformist. However, under the given economic circumstances, being a "souled" entrepreneur is not enough to induce system-level changes. Therefore, the transformative potential of SMEs that comply with key dimensions of transformative enterprises for

other than purely ecological or social motivations should also be considered (Maurer 2024, p. 59). Finally, it also seems important to note that SMEs are *one* enterprise type. While SMEs are much needed to promote sustainability transformations and can be regarded as important change agents in sustainability transformation, other types of enterprises like large publicly listed companies possess different scopes of action or transformative potentials (Schneidewind *et al.* 2012, p. 521).

8.3 The transformative potential of the timber sector

A common topic in the second and third research articles of this dissertation is the **transformative potential** of the **timber sector**. Answers to the second overarching research question, that is, *how can the timber sector promote sustainability transformation and sustainable regional development?,* can thus be found in these two articles. It is found that even though the timber sector is rather associated with a traditionalist picture than innovativeness (Nilsen *et al.* 2024), it has transformative potential. But as this dissertation focused on systemic changes towards modes of living, working and economic activity within planetary boundaries, the transformative potential identified here lies beyond technological innovations for the bioeconomy or digitalization of production. The latter two aspects have been discussed by others (Heinimann & Teischinger 2024). By referring to the literature and with illustrations from the empirical work in Bern and Vorarlberg conducted in the second and third parts of this thesis, this chapter reviews what characteristics of the timber sector can be conducive to sustainability transformation and sustainable regional development.

The literature discusses transformative potentials of the timber sector in the realms of ecology, economy and society and culture. As regards **ecology**, the timber sector's contribution to the implementation of a bioeconomy is often mentioned (Hassel *et al.* 2024, p. 26, Heinimann & Teischinger 2024, pp. 284–286) and research highlights the sector's potential to reduce the CO_2-intensity of the construction sector by replacing cement with wood-based materials (e.g., Hildebrandt *et al.* 2017) (see also chapter 4.1). Concerning **economic aspects**, scholars emphasize that the timber sector can contribute to regional value creation, provided that the resource is harvested and processed within the region (Gauzin-Müller 2020). Besides that, and as discussed in the previous chapter, the structure of the industry with many family-owned SMEs comes with certain transformative potentials. Finally, and regarding the **social and cultural dimension** of sustainability transformation, some publications find that the timber sector can contribute to a lived building culture (which may include building less but better, building low tech etc.) (Gauzin-Müller 2011, proHolz Austria 2025, pp. 22–23). This is facilitated by the fact that for many people forests and wood have a strong emotional value and community members can be included in building activities. An example of including community members in building activities is the construction of so-called 'health-kiosks', i.e. small health care provisioning centers, in communities of rural Germany (proHolz Austria 2025, pp. 14–15).

The literature also indicates that the transformative potential of the timber sector – particularly in the realms of economy and society/culture – may be utilized to promote **sustainable regional development**: with its SMEs that are rooted in the regions and its (still) often regionalized value chain, the timber sector can strengthen the local and residential economy by providing local jobs in mountainous and peripheral areas (thus making it possible to combine living and working in the same locality or region), generating income through regional value creation and fostering collaboration among local actors (cf. Segessemann & Crevoisier 2016). Apart from that, the timber sector may also be

involved in infrastructural projects for the local provision with basic services. Examples are community centers, infrastructures for healthcare like the 'health-kiosks' or a mobile library built from regional wood (proHolz Austria 2025). Moreover, sustainable regional development may also profit from the timber sector's potential to contribute to a lived building culture. In the Austrian province of Vorarlberg, for example, the excellent building culture raises the region's attractiveness for tourists and local inhabitants alike (Gauzin-Müller 2011). What is more, the timber sector can be involved in transmitting ecological values (e.g. in forest schools) (ibid., p.133f.). In sum, by supporting the local economy[38], contributing to the local building culture and transmitting ecological values, the timber sector may contribute to more resilient regional economies (cf. Kopatz 2021) and promote sustainable regional development beyond the logic of competitiveness and growth so dominant in regional development discourses (cf. Cochrane 2011).

The empirical investigations in **Bern and Vorarlberg** conducted for this dissertation illustrate the transformative potentials of the timber sector and its contributions to sustainable regional development. In what follows, I recapitulate what has been said in the second and third research articles and add a few more details. As regards **ecological** aspects, the insights from Vorarlberg show that the timber sector can contribute to the establishment of ecological building in a region. Today, timber construction is gaining importance in Vorarlberg and Bern alike. But whereas the province of Vorarlberg already started the Ecopass *(Ökologischer Gebäudeausweis)* – an ecological passport for construction, which ties subsidies for buildings to ecological criteria – in 2003 (Gauzin-Müller 2020, p. 152), interviewees from Bern noted that the public sector has been sensitized for timber construction only recently: in spring 2024, I3 and I4 told me that *"today, the Canton of Bern checks every building they construct to see whether it can be made of wood. In the past, you had to force them to do so"* (I3 & I4, spring 2024). In contrast to the booming timber construction, efforts for more cascadic or circular use of wood and the development of new products in the sense of a bioeconomy are still in their infancy in Bern and in Vorarlberg. Among the interviewed entrepreneurs many mentioned missing cascadic or circular use of wood and only two had developed respective products, that were an almost fully recyclable building system (Truberholz 2025) and a new building product made of low-quality wood called *Scrimber* (Scrimber CSC 2025).

The empirical studies in Bern and Vorarlberg also showed the transformative potential of the timber sector in terms of **economic** aspects. The findings indicate that the timber sector is likely to include many SMEs with transformative potential due to its structure with mostly small, family-owned SMEs (cf. chapter 8.2). Besides that, the comparison between Bern and the Vorarlberg illustrates how the sector can support regional value creation and the local economy. Interviewee 14 from Vorarlberg, whom I spoke to in spring 2024, emphasized the advantages of regional value creation: *"This is a very regional value chain, which really benefits the region. It starts here in the forest, continues with the sawmills and ends with the carpenters. This is very important for the region",* he told me. In the case of Vorarlberg, the benefits of the regional value chain are higher than in other regions because of intense networking and marketing activities among companies (Caneparo & Dallere 2024, p. 40). The example of Vorarlberg moreover shows how the timber sector can be involved in infrastructural projects for structurally weak regions. The list of community centers, schools, or even fire stations built by regional

[38] The Swiss New Regional Policy (NRP) has recently been revised and since 2024 the dominant export base approach is complemented with the concept of the local economy, which emphasizes the attractiveness of residential locations (Mayer *et al.* 2021a, regiosuisse 2025a).

carpenters and joiners is long (cf. Dallere 2024). Finally, the empirical investigations for this thesis indicate that firms in the timber sector can indeed provide important job opportunities in mountainous and peripheral areas. So does for example the enterprise *Truberholz,* which employs 90 persons in a remote area of the Bernese *Emmental* (oral information of the owner, spring 2025).

Lastly, the empirical investigations illustrated the transformative potential of the timber sector regarding **social and cultural** aspects. The Vorarlberg case is an example how the timber sector can contribute to a lived building culture and communicate the values of craftmanship and ecology. Institutions that connect actors along the entire value chain like the *Vorarlberger Holzbaukunst*, the *Werkraum Bregenzerwald* or the Vorarlberg Institute for Architecture are playing an important role with their marketing activities and offers for schools. For communicating the value of ecology, forest schools may moreover play an important role. The latter are quite popular in Vorarlberg and the government supported the foundation of two forest schools (Land Vorarlberg 2025b). Actors from the Bernese timber sector also noted that *"…it is the forest that somehow transmits something to people and can somehow touch them"* (interviewee 18, spring 2024) but timber building culture and craftmanship have had less influence on regional development in Bern so far.

In **conclusion,** research on the Bernese and Vorarlberg timber sectors showed that the timber sector has transformative potentials beyond technological innovations. The timber sector can promote sustainability transformation and sustainable regional development through regional value creation and by providing local jobs in peripheral and mountainous regions. The timber sector can also be a driver of a lived building culture and transmit the values of craftmanship and ecology. In the future the challenge may lie in combining transformative potentials which result from traditional characteristics of the timber sector (e.g., the promotion of regional value creation or craftmanship) with thoughtful technological advancements (e.g. the development of new building systems and products which are fully recyclable and can replace harmful substances). Put differently, the question will be what we want to conserve and where we should look for new solutions? Where are technological innovations useful and where is it more appropriate to look for social, slow or other forms of innovations – or even consider the possibility of exnovation, i.e. giving up environmentally and socially damaging technologies and practices (Trippl *et al.* 2024a)? Taking these questions seriously, the timber sector may become an important structural political actor in sustainability transformations (Schneidewind *et al.* 2012, p. 500).

8.4 Drivers and barriers of sustainability transformation

All three research articles of this dissertation discuss drivers and barriers of sustainability transformation. With their insights into the enablers and limits of change agency, these articles give answers to the third overarching research question, that is, *what are the drivers and barriers of sustainability transformation in the timber sector?* The findings indicate that resourceful individuals who act as change agents can be crucial enablers of sustainability transformation and even more so if they encounter favorable organizational and structural preconditions. However, there are also important limits of change agency such as restricted financial or time resources and limited influence of small players. What is more, transformative SMEs and other change agents must participate (at least to a certain extent) in the prevailing neoliberal market system and growth-oriented economy, which may defeat their efforts for sustainability transformation. This chapter first discusses factors enabling change agency, then illuminates limits of change agency and closes with a short summary.

Enablers of change agency

Factors enabling change agency can be identified at three different levels: the individual level, the firm level and the systemic (or regional) level. As regards the **individual level**, this dissertation found that resourceful individuals like the *Baukünstler* or the president of *Vorarlberger Holzbaukunst* who act as change agents are key to sustainability transformation. This aligns with findings from studies in EEG and transformation research (e.g., Grillitsch *et al.* 2024, Kristof 2017, Göpel 2016). The literature on agency and change agents mentions characteristics that empower individuals to become change agents. Those are specific experiences and skills as well as (extra-regional) networks (with other change agents and external actors) (Grillitsch *et al.* 2024, p. 14, Kristof 2017, p. 170f., Gibbs & O'Neill 2014, p. 1103). As regards experiences and skills of change agents, the literature highlights that factual knowledge and qualifications for the design of change processes (e.g. knowing the direction of change, being good at interacting with other people, have a self-reflexive attitude) are required (Kristof 2017, p. 170f., Kristof 2021, p. 8). Moreover, personality, energy, enthusiasm, persistence, foresight and attachment to a particular place seem important (Grillitsch *et al.* 2024, p. 14, North & Nurse 2014). The change agents identified in the empirical studies of the Bern and Vorarlberg timber sectors possessed those characteristics, whereas networking skills, extra-regional connections and the Vorarlberg *Baukünstler's* rootedness in the local culture of crafts are particularly noteworthy. What is more, the change agents' motivation and belief in change was certainly a key factor for their success.

Other enablers of change agency can be found at the **level of the firm**. According to the literature, there are several enablers of change agency such as organizational characteristics regarding technical and legal aspects or concerning the business model[39] and the capability to manage change processes (Grillitsch *et al.* 2024, p. 14). Besides that, it is said that a firm's good reputation can support its change agency (ibid, p.14). Firm characteristics concerning the business model that may promote change agency were discussed in the first and second research articles of this dissertation: key dimensions one to seven of transformative enterprises (*1 Driving mission, 2 Stability & autonomy, 3 Ecological footprint, 4 Social obligation, 5 Participatory governance, 6 Alternative products & services* and *7 People before profit*) result from firm-level agency and key dimensions eight and nine (*8 Regional embeddedness* and *9 Change agent*) are the effect of system-level agency. Moreover, the results of the second research article showed that the size of a firm and its financial resources can enable change agency. This relates to the capability to manage change processes mentioned in the literature: large firms tend to have more financial resources and can therefore invest more into personnel, research, new technologies, marketing and lobbying etc. Hence, financial resources are often equivalent with power to induce changes. Finally, the comparison of the Bern and the Vorarlberg timber sectors showed that the strong collaboration among firms and their joint marketing and lobbying efforts supported sustainability transformation in the timber sector.

Various factors at the **structural** (or regional) **level** can also enable change agency. *First,* the state plays a key role: state subsidies, tax advantages, or policies and formal institutions supporting

[39] Generally speaking, business models describe how organizations and related actors (co-)create value. Value is commonly understood in monetary terms but may also be defined more broadly. The addressee of value creation may be the organization itself but also the customers or the broader socio-ecological environment (Froese *et al.* 2023, pp. 2–3).

sustainable development can create favorable framework conditions for change agents (Gibbs & O'Neill 2014, p. 1103, Affolderbach & Schulz 2024, p. 326). In the case of the Vorarlberg timber sector examined in this dissertation, supportive state subsidies are available in the form of the Ecopass (Gauzin-Müller 2020, p. 152). In terms of policies for sustainable development, it was observed that the Vorarlberg building law allowed for experiments (Kapfinger 2003, p. 13) and regional development policies promote infrastructural buildings combining public and private functions in peripheral communities (Gauzin-Müller 2020, p. 144f.). As regards institutions, the Vorarlberg Energy Institute and the design advisory boards in Vorarlberg communities supported change agents. *Second,* the regional socio-economic structure can influence change agency. In Vorarlberg for example, a specific sales market (i.e. demand) for modern timber houses was available (cf. Affolderbach & Schulz 2024, p. 326), among others because the province is quite wealthy. *Third,* cultural and institutional factors like regional imaginaries, i.e., *"fundamental perceptions, conventions, mental representations and world views [. . .] ingrained at a very fundamental level of the regional innovation systems"* (Miörner 2022, p. 595 in: Grillitsch et al. 2024)*,* and local cultures impact change agency (Grillitsch *et al.* 2024, pp. 4–5). In the Vorarlberg case, a strong rural and entrepreneurial culture was observed. Moreover, craftmanship, collaboration and collective learning are highly estimated values, and the population has a high awareness of autonomy, self-determination and self-administration. On this ground, the *Baukünstler* movement could thrive. *Lastly,* our empirical research in Vorarlberg also showed that the local geographies, more specifically the small-scale structure of the territory where everyone knows everyone was decisive for the success of change agents.

Limits of change agency

Like the enabling factors of change agency, the **limits of change agency** can also be separated into factors concerning the individual level, the level of the firm and the structural level. As regards the **individual level**, the literature points out that there may be persons who lack the voluntary commitment to sustainability transformation and do not believe in the value of engaging for systemic changes (Gibbs & O'Neill 2014, p. 1098). This attitude applies to the SME type of the pragmatist traditionalist, who primarily 'minds his own business'. Another reason for not engaging for systemic changes are limited individual resources (ibid.): in the empirical investigation of SMEs in the Bernese timber sector (article 2, chapter 6) for example, many entrepreneurs mentioned that they did not have the time to engage in activities targeting changes at the level of the industry or the wider system.

Limits of change agency can also be observed at the **level of the firm**. Other researchers have shown that a smaller size[40] can hamper a firm's capability to become influential and to induce changes at the industry level or beyond (Gibbs & O'Neill 2014, p. 1098). One reason for the lacking influence of small firms may be that they have little financial resources, which would be needed to initiate change. Two Bernese entrepreneurs (I1 and I13), whom I interviewed in spring 2021, for example, mentioned that they did not have the finances to construct more resource-saving multistorey houses instead of single-family homes on their own or that they lacked financial resources to experiment with new

[40] Interestingly, bigger firm size appears as an enabling factor for change agency and small firm size as a limiting factor. At the same time, characteristics of transformative enterprises are probably more prevalent in SMEs than in big enterprises. This raises the question whether there is an optimal firm size for transformative enterprises. Future research could investigate that topic.

building products made of timber. The literature on firms and sustainability transformation moreover mentions entrepreneurial growth drivers which may compromise an enterprise's sufficiency orientation and can therefore be another limit of change agency. Entrepreneurial growth drivers are: (1) the type of financing and capital requirements determined by the production structure, (2) the system structure in procurement production and sales (e.g. economies of scale, minimal size required for market access etc.), (3) the interests of employees and managers in setting up operations and a hierarchical company organization, (4) marketing for demand creation and the symbolic effect of consumption and (5) accounting, which is limited to financial aspects (Posse 2015, p. 52). In the case of the wood-processing SMEs examined in Bern, the first, second and fifth growth drivers were repeatedly mentioned by interviewees. Finally, the results of this thesis showed that firms encounter more limits of change agency if the culture of collaboration among firms is not very pronounced, and people tend to think along fixed lines (as observed in the Bernese case).

More limits of change agency can be identified at the **structural level**. To begin with, cultural and institutional factors may present limits of change agency. In line with previous research (Eder & Döringer 2022, pp. 13–15), the findings of this thesis indicate that the lack of a shared vision, in our case a vision of sustainability transformation, is an important limit of change agency. SMEs like the visionary nonconformists have a different vision of sustainability transformation than their colleagues the ambitious entrepreneurs. Moreover, the lack of a shared vision is probably one reason for weak collaboration in the Bernese case. Besides cultural and institutional factors, unfavorable **structural** preconditions can also prevent changes (Eder & Döringer 2022, pp. 13–15). Previous research has identified several meso-level structural preconditions that may become limits of change agency: customers and potential users can show resistance (Pastakia 1998), for example in that they do not want to buy the sustainable but often more expensive product. Moreover, adverse economic incentives such as low standards for repairability or reusability of primary materials and the lack of restrictions on advertisement can impede transformative business strategies (Lange *et al.* 2024, p. 330f.). All these aspects were mentioned by the persons interviewed for this thesis.

Limits of change agency also come with macro-level structural preconditions. The literature on enterprises and sustainability transformation mentions that the neoliberal and globalized market system characterized by cheap resources, low-cost energy and transport possibilities, weak environmental and social standards, and low labor costs in the Global South is at odds with efforts for sustainability transformation (Lange *et al.* 2024, p. 330f.). The same is true for the prevailing growth-orientation of the economic and social system (Gossen *et al.* 2024, p. 315, Angresius *et al.* 2025, p. 8f.). Among the growth drivers that cannot be directly influenced by enterprises are population growth, a logic of growth in politics and society, the acceleration of economic processes and everyday life, the linking of the tax system, pension and health insurance to economic growth (cf. Seidl & Zahrnt 2010, p. 23) or the unrestricted creation of money by commercials banks and rising yield expectations (Posse 2015, p. 53). Many of the entrepreneurs I interviewed in spring and summer 2021 felt that given those framework conditions they had little room for maneuver: if they did not play the game of growing and lowering costs, they would be squeezed out of the market (cf. Lange 2013, p. 26).

Summary

In **conclusion**, this dissertation has shown drivers and barriers of sustainability transformation in the timber sector at the level of the individual, the firm and the larger structures. Table 5 summarizes

the drivers and barriers of sustainability transformation, which were found drawing on the example of the timber sector. The research conducted for this thesis illustrates how change agents act in a field of tension between small-scale individual actions and system-level restrictions. Individuals and firms are actors in a system, where the rules of the game are set and difficult to change (cf. Lange 2013). As the example of the Vorarlberg timber sector illustrates, is not impossible that individuals or firms induce changes. However, there must be supportive framework conditions and changes may only be possible in a small window of opportunity (Morisson & Mayer 2021). What is more, the changes observed in the Vorarlberg case are not of fundamental nature, that is, they do not question the growth-based economy. The promotion of (green) building projects could even aggravate the problem of urban sprawl (Gauzin-Müller 2020, p. 148). Empirical investigations in the Bernese timber sector highlighted that especially small SMEs face severe limits of change agency: because of their restricted financial and time resources, their transformative activities have too little radiance. Hence, it is probably not enough to count on SMEs or individuals for making changes happen, but policy and societal actors must get more involved in sustainability transformations (cf. Lange *et al.* 2024, Gossen *et al.* 2024).

Table 5: Drivers and barriers of sustainability transformation.

	LARGER STRUCTURES	FIRM	INDIVIDUAL
BARRIERS	• Lack of shared vision • Adverse economic incentives • Neoliberal & globalized market growth-orientation of economy & society	• Small firm size • Lack of financial resources • Growth drivers • Weak collaboration • Thinking along fixed lines	• Disbelief in possibility for change • Lack of resources (e.g. time)
DRIVERS	• Supporting policies & formal institutions • Local culture & institutional factors • Local geography • Regional socio-economic structure	• Transformative characteristics • Larger firm size • Financial resources • Strong collaboration • Joint marketing & lobbying	• Change agents with… • …motivation/belief in change • …specific experiences & skills • …(extra-)regional networks • …rootedness in local culture & crafts

9 Discussion and Conclusion

This concluding chapter starts with the presentation of the theoretical and empirical contributions of this dissertation in chapter 9.1. Then, in chapter 9.2, I continue with a discussion of limitations and ideas for future research. Finally, chapter 9.3 reflects on policy implications which can be derived from this dissertation's findings.

9.1 Contributions

The main contributions of this dissertation are summarized in Table 6 below. Two overarching contributions are that this research illuminates sustainability transformation from an agency perspective and from a structural perspective and that it puts evolutionary economic geography and post-growth geographies in dialogue. Moreover, each part of the dissertation delivered specific theoretical and empirical contributions. In what follows, I elaborate on those contributions.

Table 6: Overview of theoretical and empirical contributions.

	Transformative enterprise	**Agency & change agent**	**Challenge-oriented RIS & diverse innovations**
Theoretical contributions	• Develop a definition of transformative enterprises • Introduce the notion of transformative enterprise in EEG and combine it with the concept of firm- and system-level agency	• Combine and enrich agency perspectives in EEG and post-growth geographies	• Show how the CORIS concept integrates elements of post-growth thinking
Overarching contributions	(1) Illuminate sustainability transformation from an agency perspective and from a structural perspective (2) Put evolutionary economic geography (EEG) and post-growth geographies in dialogue		
Empirical contributions	• Provide a definition of transformative enterprises that is empirically applicable • Identify the transformative potentials of SMEs	• Identify five empirical types of potentially transformative enterprises • Provide an empirical study of the limits of change agency • Show the transformative potential of SMEs in the timber sector • Examine 'ordinary' economic actors like SMEs	• Provide an empirical example of RIS reconfiguration and sustainable regional development • Deliver an international comparison of transformation trajectories at a regional scale • Identify the transformative potential of the timber sector
	Article I	**Article II**	**Article III**

Theoretical contributions

The overarching **theoretical contribution** of this dissertation lies in the elaboration of **bridging potentials** between evolutionary economic geography and post-growth geographies. The bridging potentials result from the use of concepts, namely transformative enterprise, agency and change agent and challenge-oriented innovation systems, which can speak to both research traditions. By putting EEG

and post-growth geographies in dialogue and encouraging a (growth-)critical reflection of 'classical' economic geography concepts, this research also advances the discipline's engagement with systemic changes and normative questions (Chlebna *et al.* 2024, Martin 2021).

The theoretical contribution of the *first* part of the dissertation lies in developing a **definition of transformative enterprises** and formulating nine key dimensions and 30 indicators. This definition summarizes knowledge on transformative characteristics of SMEs, which has so far been dispersed and discussed under many labels in post-growth-oriented research. The first research article moreover introduced the concept of transformative enterprise in EEG and combined it with the concept of firm- and system-level agency. Through the detailed definition of transformative enterprises, the first research article also provided a micro-perspective on firms as change agents. This is an important contribution to the EEG literature, which has been criticized for its focus on aggregated firms (Kyllingstad 2020, p. 1) and where a micro-perspective on firms has long been missing (Hassink *et al.* 2019, Jolly *et al.* 2020). In sum, the concept of transformative enterprises can help investigating more into *"…how economic and other actors create, recreate, and alter paths"* (Martin 2014, p. 619) and summarizes knowledge on enterprise characteristics that can support sustainability transformation.

The *second* part of this thesis drew on the concepts of agency and change agent, which are central pillars in EEG thinking and post-growth geographies. The research conducted in this part **combines and enriches agency perspectives** of both schools of thought by using the concept of transformative enterprise, by identifying types of firms as change agents and by expanding the knowledge on actor roles in path development and sustainability transformation. This is relevant because in the EEG literature that draws on agency perspectives, the heterogeneity of firms has seldomly been illuminated through different types of agents (Jolly *et al.* 2020). What is more, actor roles, and more specifically the different roles of firms in sustainability transformations, are little researched in EEG (Sotarauta *et al.* 2021, Martin *et al.* 2023). In post-growth geographies, knowledge on types of firms as change agents and the roles firms take in sustainability transformation is also little systematized: while types of firms are discussed in the literature on green entrepreneurship or 'ecopreneurship' (Schaltegger 2002, Wagner & Schaltegger 2010, Walley & Taylor 2002), which is to some extent in line with post-growth thinking (cf. chapter 2.5, p.20), transformation and post-growth-oriented research identified different roles of change agents in the 'model of promotors' *(Promotorenmodell)*[41] (Kristof 2010, Kristof 2017, p. 170). However, those roles of change agents are generic and not firm-specific. Hence, this dissertation combines and enriches agency perspectives in EEG and post-growth geographies alike.

The *third* theoretical contribution of this thesis concerns the concept of **challenge-oriented regional innovation system (CORIS)**. The third research article indicates what I have elaborated in chapters 2.2 and 2.3: that the CORIS concept integrates elements of **post-growth thinking** by addressing grand challenges, by putting place-based problems and needs center stage and by emphasizing the need for diverse types of innovation and innovation actors (cf. Tödtling *et al.* 2021, Trippl *et al.* 2024a, Trippl 2023). These concerns resonate with research interests of post-growth

[41] In her 'model of promotors', Kristof (2010, 2017, p.170f.) differentiates between four different actor roles of change agents: they can be specialist promotors, who initiate changes and have the necessary specialist knowledge, they may act as process promotors, who develop the process of change and take communication tasks, and they can be power promotors, who have leadership competencies and the necessary (material) resources to initiate and promote change processes. Finally, change agents can also take the role of relationship promotors, who support the process promotors with their networks and conflict management.

geographies, which frequently analyze localized economic practices (Affolderbach & Schulz 2024, p. 240) and diverse types of innovations (Schulz *et al.* 2020, p. 26, Tschumi *et al.* 2020, Mayer *et al.* 2021b). This third theoretical contribution could be an entry point for fruitful dialogues between EEG and post-growth thinking and is a contribution to the emerging literature on CORIS.

Empirical contributions

The overarching **empirical contribution** of this dissertation is that it illuminates sustainability transformation from an agency perspective and from a structural perspective, which are both necessary for understanding transformation (Lange *et al.* 2024, p. 335). The first and second research articles adopted agency perspectives, while the third research article drew on the concept of CORIS, which illuminates structural aspects of sustainability transformation.

The *first* part of the dissertation contributed empirically by providing a **definition of transformative enterprises** that can be used for empirical investigations. Besides informing interview guides, the definition may also be translated into a standardized questionnaire. This was done in a Bachelor thesis written in the Economic Geography Research Unit of the Geographical Institute of the University of Bern (cf. Suter 2024). Hence, the definition of transformative enterprises developed here complements the work of others, who aimed at providing empirically applicable frameworks for transformative business: namely Khmara & Kronenberg (2018), who identified seven criteria for degrowth-oriented business and applied them to the company Patagonia, Hankammer et al. (2021), who presented five main criteria for organizations approaching degrowth and applied them to four organizations certified as 'B corps', and Hinton (2021), who identified five key dimensions of post-growth business, which she illustrated with a discussion of five firms featuring prominently in sustainable business discussions. By summarizing the enterprise characteristics mentioned in those and other contributions, the first research article of this dissertation identifies the transformative potentials of SMEs.

The empirical contribution of the *second* part of this thesis lies in showing **evidence of change agents** by drawing on a qualitative study, which has so far been rare (Eder & Döringer 2022, p. 2, MacKinnon *et al.* 2019a, p. 131, Trippl *et al.* 2020, p. 196). More concretely, the contribution is the identification of five empirical types of potentially transformative enterprises, the provision of a study of the limits of change agency and the illustration of the transformative potential of SMEs in the timber sector. The typification of SMEs adds to the literature on agency and path development, where types of actors are seldomly identified (Jolly *et al.* 2020). The five empirical types of potentially transformative enterprises are moreover a contribution to the literature on sustainable entrepreneurship (broadly conceived), where theoretical types of enterprises that strive for sustainability are known (cf. Walley & Taylor 2002, Schaltegger 2002, Wagner & Schaltegger 2010, Dyllick & Muff 2016) but empirical typifications are seldomly made (for an example cf. Pastakia (1998)). This dissertation also contributes to better understanding limits of change agency by investigating how SMEs in the Bernese timber sector struggle to implement changes. Up to now, only few studies have engaged with limits of change agency (Eder & Döringer 2022, Weller & Beer 2022). Finally, this thesis shows the transformative potential of SMEs in the timber sector. This speaks to research on transformation in natural resource-based industries (Hassel *et al.* 2024, Heinimann & Teischinger 2024) and to studies on sustainability transformation and post-growth. 'Ordinary' economic actors like SMEs have so far received little attention in transformation and post-growth research (Liesen *et al.* 2013, Posse 2015). With its empirical focus on

SMEs, this thesis adds knowledge to this research field.

The *third* part of this dissertation contributed empirically in a threefold way: it provided an empirical application of the concept of **CORIS and RIS reconfiguration**, it delivered an international **comparison** of transformation trajectories at a regional scale, and it identified the **transformative potential** of the **timber sector**. The CORIS concept has only recently been developed and there are only few examples of its empirical application (Campos Mühlenhoff & Herzig 2024, Fromhold-Eisebith 2024). Systematic comparative studies of different CORIS have also not yet been conducted but can be insightful for understanding the link between system-level agency and RIS reconfiguration (Trippl *et al.* 2024a, p. 5, Tödtling *et al.* 2021, p. 15). Apart from contributing to empirical research on CORIS, the insights gained from Vorarlberg also showed how the timber sector can contribute to sustainable regional development in peripheral and mountain regions. Hence, it adds knowledge to research on natural resource-based industries, particularly the timber sector. The latter has neither received much attention in EEG (e.g. Edenhoffer & Hayter 2013, Hayter & Edenhoffer 2016) nor in post-growth geographies (Creutzburg 2022).

9.2 Limitations and future research

This chapter discusses **limitations** of this dissertation and identifies avenues for **futures research**. Two limitations result from the **theoretical approach** adopted. *First,* the agency perspective I adopted used the concepts of firm-level agency and system-level agency. Focusing on other conceptions of agency, such as innovative entrepreneurship, place-based leadership, institutional entrepreneurship and structural maintenance (cf. Grillitsch & Sotarauta 2019, Jolly *et al.* 2020), could provide more insights into the diverse types of agency and actors involved in sustainability transformation. An interesting question would be what agency types dominate in different phases of transformation processes (for an example drawing on the process of social innovations cf. Samuel Wirth et al. (2023)). *Second*, even though this thesis illuminated sustainability transformation from an agency perspective and from a structural perspective, it provides limited insights into the interplay between different levels of transformation (e.g., how transformation spreads from the niche or how structural changes affect transformation) because they are not in the focus of the concepts of agency and CORIS. To study this interplay, it may be fruitful to draw on the multi-level perspective (MLP) used in transition research (cf. Geels 2011) in future studies (despite the reservations mentioned in footnote 4, p.5).

Six other limitations result from the **research design**. *First,* this dissertation applied qualitative methods and analyzed a small sample size. Moreover, the empirical focus was on the timber sector in Switzerland and Austria only. For more generalizability, quantitative studies on transformative enterprises and sustainable regional development (e.g. based on a questionnaire like the study carried out by Liesen et al. (2013)) could be conducted. Besides that, future research could study the transformative potential of other sectors and examine sustainability transformation in other than Central European contexts. *Second,* the definition of transformative enterprises depicts an ideal-typical transformative enterprise and applies to SMEs only. Moreover, it is theoretical and based on a small number of case studies form the industrialized world. Insights form more empirical case studies covering different industries and geographical contexts would be useful to refine the definition and thereby expand system knowledge on existing and possible transformative practices and business models, including factors of success and barriers (Schneidewind *et al.* 2012, p. 522). Studies on the

transformative potential of big enterprises (in comparison to SMEs) as well as the transformative potential of enterprises motivated by other than ecological or social values (cf. Walley & Taylor 2002, p. 33) would also be important. A *third* limitation resulting from the research design is that the typology of five potentially transformative enterprises developed in the second research article is based on a small empirical sample and thus specific for the Bernese case study. Future empirical research in different industrial contexts could validate and refine the typology. This would also answer the question to what extent there are industry-specific types of transformative enterprises. Besides that, future studies should examine to what extent the typology proposed in this thesis is congruent with other empirical and theoretical typifications of sustainable enterprises found in the literature (cf. Walley & Taylor 2002, Schaltegger 2002, Wagner & Schaltegger 2010, Dyllick & Muff 2016).

Table 7: Limitations and propositions for future research.

	Limitation	**Future research**
Theoretical approach	Agency perspective only used the concepts of firm-level and system-level agency.	Focus on other conceptions of agency (e.g. innovative entrepreneurship, place-based leadership, institutional entrepreneurship, structural maintenance).
	Use of concepts (agency, CORIS) allows limited insights into the interplay between different levels of transformation (e.g. firm level, regional level).	Draw on MLP from transition research to study interplay between different levels of structuration.
Research design	**Qualitative study** with small no. of cases allows only limited generalizations. Empirical focus on **timber sector** in **Switzerland & Austria** means that conclusions are specific for those contexts.	Apply quantitative methods to the study of transformative enterprises and sustainable regional development. Study the transformative potential of other sectors. Investigate transformation in other than Central European contexts.
	Definition of transformative enterprises is: • Ideal-typical • Theoretical • Based on small no. of studies from the industrialized world • Describing SMEs only	Refine definition of transformative enterprises by integrating insights from: • More empirical case studies • Different industries • Different geographical contexts • The transformative potential of big enterprises & enterprises motivated by other than ecological/social values
	Typology of 5 potentially transformative enterprises is based on a small empirical sample and thus specific for the Bernese case study.	Validate and refine typology with other empirical cases from different industries. Examine to what extent the typology is congruent with other empirical and theoretical typifications of sustainable enterprises found in the literature.
	The empirical studies of the timber sector in Bern and Vorarlberg only provide a spotlight on **the limits of change agency** and **structural barriers** to transformative change and have a regional focus.	Expand study on limits of change agency and structural conditions that impede sustainability transformation. Address for example… • networks, industrial & macroeconomic context • power structures & policies • goal conflicts and conflicts of interest • limits of change agency of big enterprises
	Diverse forms of innovation were not explicitly studied in the comparison of the Bern and the Vorarlberg timber sectors.	Focus on diverse innovations in future studies of RIS reconfiguration.
	Transformative enterprises have not been examined in detail in **Vorarlberg** and **diverse forms of innovation.**	Conduct a follow-up study on the role of SMEs in sustainable regional development.

Fourth, the empirical studies of the timber sector in Bern and Vorarlberg only provide a spotlight on the limits of change agency and structural barriers to transformative change and have a regional focus (i.e. extra-regional influences ranging from the national to the EU to the international level were not considered). More studies on this topic are needed. The wider networks in which individual agents are embedded and the industrial and macroeconomic context firms are part of deserve attention (Gibbs & O'Neill 2014, p. 1102, Schneidewind *et al.* 2012, p. 522). Besides that, power structures and policies that impede or promote sustainability transformation are of particular interest (Lange *et al.* 2024, p. 335). Deeper knowledge on conflicts of interest and goal conflict would also be key for understanding limits of change agency (Strunz & Schindler 2018, p. 69). Finally, future research could investigate the limits of change agency of big enterprises. The question whether and how they can live up to social and ecological values while participating in the mainstream economy seems interesting. A *fifth* limitation is that diverse innovations were not explicitly studied in the comparison of the Bern and the Vorarlberg timber sectors. Future studies on RIS reconfiguration should focus more on diverse types of innovation. *Finally,* the fact that transformative enterprises have not been examined in detail in Vorarlberg means that this thesis can only provide limited insights into the role of transformative SMEs for changing regional path development. Follow-up studies on the role of SMEs in sustainable regional development would help to better understand *"the roles and capacities of firms in contributing to the transformative industrial change of regional industries"* (Martin *et al.* 2023, p. 10). Table 7 summarizes the limitations and propositions for future research.

9.3 Policy implications

In this last chapter, I reflect on **policy implications** of this dissertation focusing on the **Swiss** and the **Bernese context**. More concretely, the questions what measures would benefit sustainability transformation in the Bernese timber sector and how transformative enterprises in the timber sector could be supported are addressed. The propositions made here may also have some relevance for other regions than Bern. However, they should be adapted carefully to other regional contexts because each region has its specificities and therefore needs place-based regional policies (Tödtling & Trippl 2005). Even though this thesis opens the question how the transition to a post-growth society could be achieved, I do not discuss propositions for radical transformative policies here. The latter can be found elsewhere (cf. Schmid (2020, p. 64) for macroeconomic discussions and Gebauer et al. (2017) for economic policies fostering post-growth at the level enterprises).

Table 8 summarizes the policy implications and lists possible measures. The policy implications discussed here address **three areas**: the societal framework conditions, the political framework conditions and the sectoral framework conditions. As regards the **societal framework conditions**, I see two policy implications. *First,* I propose to better anchor the topic of forests and wood in society. As shown in the third research article (chapter 7) and in chapter 8.3, the topic is very present in the public discourse in Vorarlberg (e.g. brochure on the price for best timber buildings in the regional newspaper, established forests schools etc.), which seems to foster understanding, acceptance and popularity of the resource wood. The topic of forest and wood could already be discussed in primary schools or in forest schools and kindergartens. Thematic excursions and contributions in newspapers, social media etc. may also be beneficial. Such measures could contribute to an enhanced understanding of the ecological value

of forests. At the same time, conflicts of use would be mitigated if people understand the reasons for wood harvesting. Moreover, initiatives around this topic could also spark the interest of future wood professionals. *Second*, efforts should be undertaken to increase the acceptance and popularity of building culture: as the example of Vorarlberg has shown, building culture can contribute to sustainable regional development. Staff in planning departments could be sensitized more on the topic; exhibitions, presentations, lectures etc. on building culture could spread its popularity; and creating an institution for the promotion of building culture (like the example of the Vorarlberg Institute for Architecture) could also be helpful. The National Research Program No. 81 on building culture (NFP81 Baukultur), which is running between 2025 and 2030, is a first step towards strengthening building culture in Switzerland (Schweizerischer Nationalfonds 2025).

Regarding the **political framework conditions**, I see three concrete implications of this thesis. *First,* ecological building should be promoted and rewarded more than it is the case today. The Vorarlberg case study indicates that instruments like the Ecopass are highly efficient and have inspired similar policies in France (Gauzin-Müller 2020, p. 153). Inspiration could also be drawn from the Vorarlberg Energy Institute to create a competence center for ecological building. The recent revision of the National Law on Public Procurement (*Bundesgesetz über das öffentliche Beschaffungswesen BöB*) (Anon. 2019), which now gives more weight to aspects of quality, and the Strategy for CO_2-reduction in infrastructure construction (*Strategie zur CO_2-Verminderung im Infrastrukturbau*) (Anon. 2024) are first steps towards the promotion of ecological building. *Second,* policies targeting the implementation of a wood-based bioeconomy in Switzerland (the *Ressourcenpolitik Holz* in particular) should incorporate small-scale, regionalized solutions and prioritize the use of regional wood (cf. Studer & Poldervaart 2017, p. 5). Like this, very small and ecologically oriented SMEs would have a chance to participate in these new developments. Besides that, efficiency strategies (e.g. cascadic use) must be complemented with consistency- and sufficiency strategies (Hassel *et al.* 2024, p. 229) because wood will become scarce in the future (Heinimann & Teischinger 2024, p. 327). *Third*, it seems important to promote diverse types of innovation because they are pivotal for sustainable regional development. Even though this thesis did not analyze diverse types of innovation in detail, social, institutional and other innovations were certainly at play in the formation of institutions and networks observed in the Vorarlberg case study (the foundation of *Vorarlberger Holzbaukunst* or *Werkraum Bregenzerwald,* for example, could be seen as a social innovation because it involves new forms of collaboration that lead to novel ideas and positively affect society). The collection of best-practice examples of diverse innovations that contribute to sustainable regional development is one possible measure. Moreover, existing funding schemes such as the New Regional Policy and innovation promotion agencies like the Swiss Agency for Innovation Promotion (*Innosuisse*) or the location promotion of the Canton of Bern (*Standortförderung Kanton Bern*) should integrate an extended understanding of innovation.

In terms of **sectoral framework conditions**, this thesis has four concrete implications. *First,* networks and collaboration across the entire value chain and with architecture should be created or improved. In Vorarlberg, it was through the strong networks and close collaboration between crafts and architecture that regional value creation was strengthened. *Second,* architects and large developers such as Cantons and communities must be convinced to build in wood. To do so, marketing and lobbying activities as well as the creation of flagship projects could be helpful. *Third,* regional value creation should rank high on the priority list of the timber sector. Closing gaps in the value chain and making more than monetary values of regional wood visible (e.g. through labels & campaigns) – like it was

done in Vorarlberg with a campaign for the use of the silver fir, which is abundant in the region (Gauzin-Müller 2011, p. 208) – could be a way forward. *Finally,* specific measures should be taken to support transformative enterprises in the timber sector. This research confirmed the importance of individual change agents, which implies attention to more people-based and bottom-up initiatives (Grillitsch *et al.* 2024, p. 19). In a first step, one would need to identify the potentially transformative enterprises in the sector and then facilitate networking among those change agents. Awarding ecological and/or social engagement of SMEs, creating an idea portal to collect transformative ideas of SMEs and organizing exchanges between industry associations and pioneering entrepreneurs could also be helpful. With the integration of sustainability and local economy as cross-cutting themes, the New Regional Policy (see Meili & Mayer 2024) may provide funding for the support of transformative enterprises in the timber sector.

Taken together, the policy implications and measures proposed above could drive forward sustainability transformation in the Bernese timber sector. The proposed measures are first ideas. Discussing them with other researchers and practitioners (for example through focus groups) would be a further step to disseminate the research results, to reflect them collaboratively and to give back knowledge to the community.

Table 8: Policy implications and possible measures.

Area	Policy implication and possible measures Political levels involved: FS (Federal State), CA (Canton), CO (Communities) Actors involved: IA (Industry associations), F (Firms)
Societal framework conditions	**Anchor the topic of forest & wood in society** • Address the topic in primary school (CA, CO) • Support the establishment of forest schools/kindergartens (CA, CO) • Organize thematic excursions for a broad public (CA, CO, IA) • Place thematic contributions in newspapers, social media etc. (CA, CO, IA)
	Invest in the acceptance and popularity of building culture • Sensitize staff of Federal, Cantonal and Communal planning departments on the topic (FS, CA, CO) • Organize exhibitions, presentations, lectures etc. on the topic (CA, IA) • Consider the creation of an institution promoting building culture (CA)
Political framework conditions	**Promote and reward ecological building** • Introduce a policy that rewards ecological building (for private and public builders) (CA) • Create a competence center for ecological building (CA)
	Head for a small-scale, regionalized wood-based bioeconomy • Support development of small, networked boutique refineries producing specialized products (FS, CA, IA) • Prioritize the use of regional wood in biorefineries (FS, CA, IA) • Combine efficiency strategies (cascadic use) with consistency- and sufficiency strategies (FS, CA, IA)
	Promote diverse types of innovation • Acknowledge importance of other than technological innovations for regional development (CO, CA, FS) • Collect best-practice examples of diverse innovations that contribute to sustainable regional development (FS, CA) • Anchor the extended understanding of innovation in existing funding policies (CA, FS)
Sectoral framework conditions	**Create & improve networks and collaboration** • Improve collaboration across the entire wood value chain (CA, IA, F) • Establish collaborations with architecture (CA, IA, F)
	Convince architects and large developers to build in wood • Increase marketing & lobbying efforts (CA, IA) • Create flagship projects (CA)
	Increase regional value creation • Close gaps in the regional value chain (CA, IA, F) • Invest in product finishing/processing, use side products (CA, F) • Make other than monetary values visible (e.g. through labels, campaigns for regional wood) (FS, CA, IA)
	Support transformative enterprises (change agents) • Identify transformative enterprises (CA, IA) • Facilitate networking among change agents (CA, IA) • Award social and ecological engagement of SMEs (CA, IA) • Create an idea portal to collect transformative ideas of SMEs (CA, IA, F) • Organize regular exchanges between industry associations and pioneering entrepreneurs (IA, F)

IV. REFERENCES

10References

AFFOLDERBACH, J. & KRUEGER, R. 2017. “Just” ecopreneurs: re-conceptualising green transitions and entrepreneurship. *Local Environment*, **22**, 410–423, 10.1080/13549839.2016.1210591.

AFFOLDERBACH, J. & MÉDARD DE CHARDON, C. 2021. Just transitions through digitally enabled sharing economies? *Die Erde*, **4**, 244–295.

AFFOLDERBACH, J. & SCHULZ, C. 2024. *Wirtschaftsgeographien der Nachhaltigkeit*. Bielefeld: transcript Verlag.

ALBERT, R., BERGUSCH-PFEFFERKORN, K., KANZ, G., LAMERS, G., PLAS, C., PLIMON, I., SCHMID-SCHMIDSFELDERN, H., et al. 2019. *Bioökonomie - eine Strategie für Österreich*. Wien Available at: https://www.bmk.gv.at [Accessed February 5, 2024].

AMT FÜR WALD (KAWA). 2018. *Nachhaltigkeitsbericht 2018, Zahlen und Fakten zum Zustand des Berner Waldes*. Bern, 1–35 pp.

ANGRESIUS, L., BÜCHS, M. & O’NEILL, D.W. 2025. Towards a post-growth policymaking: Barriers and enablers for sustainable wellbeing initiatives, 1–26 pp. Available at: https://arxiv.org/abs/2501.17600 [Accessed April 10, 2025].

Anon. 2019. Bundesgesetz über das öffentliche Beschaffungswesen (BöB). 1–44 Available at: https://fedlex.data.admin.ch/eli/cc/2020/126 [Accessed April 4, 2025].

Anon. 2024. *Umsetzungs- und Forschungsstrategie zur Dekarbonisierung des Infrastrukturbaus mit Fokus auf Holz. Erstellt im Auftrag der Motion 21.3293 Stark SR vom 18. März 2021*. Bern, 1–16 pp. Available at: https://www.newsd.admin.ch/newsd/message/attachments/91009.pdf [Accessed April 4, 2025].

ARL - AKADEMIE FÜR RAUMENTWICKLUNG DER LEIBNIZ-GEMEINSCHAFT. 2021. Der Beitrag nachhaltiger Raumentwicklung zur Grossen Transformation. Impulse für neue Strategien. *Positionspapier aus der ARL 121*, 10 Available at: https://nbn-resolving.org/urn:nbn:de:0156-01211.

ASHEIM, B.T., ISAKSEN, A. & TRIPPL, M. 2019. *Advanced Introduction to Regional Innovation Systems*. Cheltenham,Northampton: EdwardElgar.

BÆKKELUND, N.G. 2021. Change agency and reproductive agency in the course of industrial path evolution. *Regional Studies*, **55**, 757–768, 10.1080/00343404.2021.1893291.

BUNDESAMT FÜR UMWELT BAFU. 2018. Jahrbuch Wald und Holz 2018. *Umwelt-Zustand*, 1–106.

BARTLETT, L. & VAVRUS, F. 2017a. Comparative Case Studies: An Innovative Approach. *Nordic Journal of Comparative and International Education (NJCIE)*, **1**, 5–17, 10.7577/njcie.1929.

BARTLETT, L. & VAVRUS, F. 2017b. *Rethinking Case Study Research. A Comparative Approach*. New York: Routledge, 132 pp, 10.4324/9781315674889.

BATHELT, H.& & GLÜCKLER, J. 2018. *Wirtschaftsgeographie*. 4. Auflage. Stuttgart: Eugen Ulmer KG, 502 pp.

BAUMGARTINGER-SEIRINGER, S., MIÖRNER, J. & TRIPPL, M. 2020. Towards a stage model of regional industrial path transformation. *Industry and Innovation*, **00**, 1–22, 10.1080/13662716.2020.1789452.

BENNER, M. 2023. System-level agency and its many shades: path development in a multidimensional innovation system. *Regional Studies*, **58**, 238–251, 10.1080/00343404.2023.2179614.

BHASKAR, R. 2008. *A Realist Theeory of Science*. Oxon, New York: Routledge.

BINZ, C. & CASTALDI, C. 2024. Toward a normative turn in research on the geography of innovation? Evolving perspectives on innovation, institutions, and human well-being. *Progress in Economic Geography*, **2**, 100018, 10.1016/j.peg.2024.100018.

BLAIR, M.J., CABRAL, L. & MABEE, W.E. 2017. Biorefinery strategies: exploring approaches to developing forest-based biorefinery activities in British Columbia and Ontario, Canada. *Technology Analysis and Strategic Management*, **29**, 528–541, 10.1080/09537325.2016.1211266.

BLAŽEK, J. & KVĚTOŇ, V. 2022. Towards an integrated framework of agency in regional development: the case of old industrial regions. *Regional Studies*, **0**, 1–16, 10.1080/00343404.2022.2054976.

BOCKEN, N.M.P. & SHORT, S.W. 2016. Towards a sufficiency-driven business model: Experiences and opportunities. *Environmental Innovation and Societal Transitions*, **18**, 41–61, 10.1016/j.eist.2015.07.010.

BOGERS, M., AFUAH, A. & BASTIAN, B. 2010. Users as innovators: A review, critique, and future research directions. *Journal of Management*, **36**, 857–875, 10.1177/0149206309353944.

BOSCHMA, R. & MARTIN, R. eds. 2010. *The Handbook of Evolutionary Economic Geography*. Cheltenham, Northampton: Edward Elgar.

BOSCHMA, R.A. & FRENKEN, K. 2006. Why is economic geography not an evolutionary science? Towards an evolutionary economic geography. *Journal of Economic Geography*, **6**, 273–302, 10.1093/jeg/lbi022.

BROWN, L. & WILLIAMS, A. eds. 2000. *Cassell's English Dictionary*. London: Cassell & Co, 1453 pp.

BRUCKNER, J. 2024. Towards a Characterization of Sufficiency-Oriented Businesses. Enhancing their Understanding and Identifying Key Dimensions. *In* Gossen, M. & Niessen, L., *eds. Sufficiency in Business. The Transformative Potential of Business for Sustainability*. Bielefeld, Germany: transcript Verlag, 17–42., 10.14361/9783839469101.

BUNDESAMT FÜR STATISTIK BFS. 2019. Kleine und mittlere Unternehmen. *Definition KMU* Available at: https://www.bfs.admin.ch/bfs/de/home/statistiken/industrie-dienstleistungen/unternehmen-beschaeftigte/wirtschaftsstruktur-unternehmen/kmu.html [Accessed March 20, 2020].

BUNDESAMT FÜR UMWELT BAFU. 2001. 125 Jahre Waldgesetz: eine nachhaltige Erfolgsgeschichte Available at: https://www.admin.ch/gov/de/start/dokumentation/medienmitteilungen.msg-id-8245.html [Accessed September 27, 2024].

BÜRGI, P., MÜLLER, A., SEKOT, W., TOSCANI, P., ENGLERT, H., PAULI, B. & METZKER, M. 2022. Kennzahlenvergleich zwischen Flachland- und Gebirgsforstbetrieben in der DACH-Region. *Schweizerische Zeitschrift für Forstwesen*, **173**, 238–246, 10.3188/szf.2022.0238.

CAMPOS MÜHLENHOFF, S. & HERZIG, C. 2024. Challenge-oriented Development in a Regional Innovation Network: A Case Study from the State of Hesse in Germany. *Advance in Sustainability*, **4**, 1–11, 10.26855/as.2024.03.001.

CANEPARO, L. & DALLERE, C. 2024. Architecture and local resources: project experiences in Vorarlberg. *Archalp*, **12**, 37–65, 10.30682/aa2412f.

CHLEBNA, C., EVENHUIS, E. & MORALES, D. 2024. Economic geography and planetary boundaries: Embracing the planet's uncompromising call to action. *Progress in Economic Geography*, **2**, 100021, 10.1016/j.peg.2024.100021.

CHLEBNA, C., MARTIN, H. & MATTES, J. 2023. Grasping transformative regional development –

Exploring intersections between industrial paths and sustainability transitions. *Environment and Planning A*, **55**, 222–234, 10.1177/0308518X221137346.

COCHRANE, A. 2011. Alternative approaches to local and regional development. *In* Pike, A., Rodriguez-Pose, A. & Tomaney, J., *eds. Handbook of Local and Regional Development*. Oxon and New York: Routledge, 97–105.

COENEN, L., ASHEIM, B., BUGGE, M.M. & HERSTAD, S.J. 2017. Advancing regional innovation systems: What does evolutionary economic geography bring to the policy table? *Environment and Planning C: Politics and Space*, **35**, 600–620, 10.1177/0263774X16646583.

CRESWELL, J.W. 2009a. *Research Design. Qualitative, Quantitative and Mixed Methods Approaches.* 3rd edition. London: SAGE Publications Inc., 260 pp.

CRESWELL, J.W. 2009b. *Research Design. Qualitative, Quantitative and Mixed Methods Approaches.* 3rd editio. London: SAGE Publications Inc., 260 pp.

CREUTZBURG, L. 2022. Growing Trees for a Degrowth Society: An Approach to Switzerland's Forest Sector. *Environmental Values*, **31**, 721–750, 10.3197/096327121X16387842836959.

DALLERE, C. 2024. Experiences in Vorarlberg. *Archalp*, **12**, 43–65, 10.30682/aa2412g.

DEIMLING, D. 2016. *Sinnstrukturen und Muster nachhaltiger Unternehmen im Kontext der Wachstumskritik - Eine Untersuchung unter Einsatz einer Systemaufstellung*. Müller-Christ, G., *ed.* Wien: LIT Verlag GmbH & Co. KG, 363 pp. Available at: https://premium-cola.de/downloads/wissenschaft/Dissertation_Deimling_Druck.pdf.

DEMARIA, F., KALLIS, G. & BAKKER, K. 2019. Geographies of degrowth: Nowtopias, resurgences and the decolonization of imaginaries and places. *Environment and Planning E: Nature and Space*, **2**, 431–450, 10.1177/2514848619869689.

DONALD, B. & GRAY, M. 2019. The double crisis: in what sense a regional problem? *Regional Studies*, **53**, 297–308, 10.1080/00343404.2018.1490014.

DÖRRY, S. & SCHULZ, C. 2018. Green financing, interrupted. Potential directions for sustainable finance in Luxembourg. *Local Environment*, **23**, 717–733, 10.1080/13549839.2018.1428792.

DREXEL, C. 2023. *Brennholz in Vorarlberg: Analyse der Stoff- und Energieströme; strategische Grundlagen und mögliche Massnahmen*. Bregenz, 1–15 pp. Available at: https://vorarlberg.at/documents/302033/472360/drexel%20reduziert%20GmbH%202023_Brennholzstudie.pdf/fb6464cc-d3ec-fe58-fb07-c3e2b623df91?t=1708532989041 [Accessed September 20, 2024].

DYLLICK, T. & MUFF, K. 2016. Clarifying the Meaning of Sustainable Business: Introducing a Typology From Business-as-Usual to True Business Sustainability. *Organization and Environment*, **29**, 156–174, 10.1177/1086026615575176.

EDENHOFFER, K. & HAYTER, R. 2013. Restructuring on a vertiginous plateau: The evolutionary trajectories of British Columbia's forest industries 1980-2010. *Geoforum*, **44**, 139–151, 10.1016/j.geoforum.2012.10.002.

EDER, J. & DÖRINGER, S. 2022. The Limits of Change Agency: Establishing a Peripheral University Campus in East Tyrol. *Local Economy*, **37**, 297–316, 10.1177/02690942221122100.

EICHMANN, H. 2020. Arbeitszeitverkürzung in Kleinbetrieben als Postwachstumspraxis? *In* Lange, B., Hülz, M., Schmid, B. & Schulz, C., *eds. Postwachstumsgeographien. Raumbezüge diverser und alternativer Ökonomien*. Bielefeld, Germany: transcript Verlag., 10.14361/9783839451809.

EISENHARDT, K.M. & GRAEBNER, M.E. 2007. Theory Building from Cases: Opportunities and

Challenges. *The Academy of Management Journal*, **50**, 25–32.

EMIRBAYER, M. & MISCHE, A. 1998. What is Agency? *American Journal of Sociology*, **4**, 962–1023.

EUROPEAN COMMISSION. 2018. *A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment. Updated bioeconomy strategy*. Brussels, 1–107 pp.

EUROPEAN COUNCIL. 2025. European Green Deal Available at: https://www.consilium.europa.eu/en/policies/european-green-deal/ [Accessed April 10, 2025].

FINANZVERWALTUNG KANTON BERN. 2023. Kennzahlen Kanton Bern 2022 Available at: https://www.fin.be.ch/de/start/themen/OeffentlicheStatistik/kennzahlen-und-portraets.html [Accessed August 20, 2024].

FLETCHER, A.J. 2017. Applying critical realism in qualitative research: methodology meets method. *International Journal of Social Research Methodology*, **20**, 181–194, 10.1080/13645579.2016.1144401.

FLICK, U. 2017. *Qualitative Sozialforschung. Eine Einführung*. 8th ed. Reinbeck bei Hamburg: Rowohlt Verlag.

FLICK, U., VON KARDORFF, ERNST, KEUPP, H., VON ROSENSTIEL, L. & WOLFF, STEPHAN. 1995. *Handbuch Qualitative Sozialforschung: Grundlagen, Konzepte, Methoden und Anwendungen*. 2. Auflage. Flick, U., von Kardorff, Eernst, Keupp, H., von Rosenstiel, L. & Wolff, Stefan, *eds.* Weinheim: BELTZ Psychologie Verlags Union.

FORSTWESEN VORARLBERG. 2021. *Vorarlberger Waldstrategie 2030+*. Bregenz Available at: www.vorarlberg.at/land-forstwirtschaft.

FRITSCHE, U., BRUNORI, G., CHIARAMONTI, D., GALANAKIS, C.M., HELLWEG, S., MATTHEWS, R. & PANOUTSOU, C. 2020. *Future transitions for the Bioeconomy towards Sustainable Development and a Climate-Neutral Economy*. Luxembourg, 103 pp, 10.2760/667966.

FROESE, T., RICHTER, M., HOFMANN, F. & LÜDEKE-FREUND, F. 2023. Degrowth-oriented organisational value creation: A systematic literature review of case studies. *Ecological Economics*, **207**, 107765, 10.1016/j.ecolecon.2023.107765.

FROMHOLD-EISEBITH, M. 2024. How can a regional innovation system meet circular economy challenges? Conceptualization and empirical insights from Germany. *Cambridge Journal of Regions, Economy and Society*, **17**, 637–648, 10.1093/cjres/rsae024.

GAUZIN-MÜLLER, D. 2011. *Ökologische Architektur in Vorarlberg. Ein soziales, ökonomisches und kulturelles Modell.* Wien & New York: Springer-Verlag.

GAUZIN-MÜLLER, D. 2020. The Ecological Transition of Vorarlberg and Its Implementation in France. *In* Fanfani, D. & Mataran Ruiz, A., *eds. Bioregional Planning and Design: Volume II. Issues and Practices for a Bioregional Regeneration a* . Cham: Springer International Publishing, 141–155., 10.1007/978-3-030-46083-9_8.

GEBAUER, J., LANGE, S. & POSSE, D. 2017. Wirtschaftspolitik für Postwachstum auf Unternehmensebene: Drei Ansätze zur Gestaltung. *In* Adler, F. & Schachtschneider, U., *eds. Postwachstumspolitiken : Wege zur wachstumsunabhängigen Gesellschaft*. München: Oekom, 239–251.

GEELS, F.W. 2011. The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, **1**, 24–40, 10.1016/j.eist.2011.02.002.

GIBBS, D. & O'NEILL, K. 2014. Rethinking sociotechnical transitions and green entrepreneurship: The potential for transformative change in the green building sector. *Environment and Planning A*, **46**, 1088–1107, 10.1068/a46259.

GIBSON, C. & WARREN, A. 2020. Keeping time with trees: Climate change, forest resources, and experimental relations with the future. *Geoforum*, **108**, 325–337, 10.1016/j.geoforum.2019.02.017.

GIBSON, C. & WARREN, A. 2016. Resource-Sensitive Global Production Networks: Reconfigured Geographies of Timber and Acoustic Guitar Manufacturing. *Economic Geography*, **92**, 430–454, 10.1080/00130095.2016.1178569.

GIBSON-GRAHAM, J.K. 2008. Diverse economies: Performative practices for "other worlds." *Progress in Human Geography*, **32**, 613–632, 10.1177/0309132508090821.

GOLDHAHN, C., CABANE, E. & CHANANA, M. 2021. Sustainability in wood materials science: An opinion about current material development techniques and the end of lifetime perspectives. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, **379**, 10.1098/rsta.2020.0339.

GONG, H. & HASSINK, R. 2020. Context sensitivity and economic-geographic (re)theorising. *Cambridge Journal of Regions, Economy and Society*, **13**, 475–490, 10.1093/cjres/rsaa021.

GÖPEL, M. 2016. *The Great Mindshift : how a new economic paradigm and sustainability transformations go hand in hand*. Cham: Springer International Publishing, 10.1007/978-3-319-43766-8.

GOSSEN, M. & NIESSEN, L. eds. 2024. *Sufficiency in Business - The Transformative Potential of Business for Sustainability*. Bielefeld: transcript Available at: https://www.researchgate.net/publication/380513207.

GOSSEN, M., TRÖGER, J. & FRICK, V. 2024. Limits of Sufficiency Strategies in Business Practices. Overcoming Business-Related Boundaries for a Transition Towards Sufficiency. *In* Gossen, M. & Niessen, L., *eds. Sufficiency in Business. The Transformative Potential of Business for Sustainability*. Bielefeld, Germany: transcript Verlag., 10.14361/9783839469101.

GRABHER, G. 2018. Marginality as strategy: Leveraging peripherality for creativity. *Environment and Planning A*, **50**, 1785–1794, 10.1177/0308518X18784021.

GREGORY, D., JOHNSTON, R., GERALDINE, P., WATTS, M. & WHATMORE, S. eds. 2009. *The Dictionary of Human Geography*. 5th edition. Chichester: Wiley-Blackwell, 1–1052 pp.

GRILLITSCH, M. 2019. Following or breaking regional development paths: on the role and capability of the innovative entrepreneur. *Regional Studies*, **53**, 681–691, 10.1080/00343404.2018.1463436.

GRILLITSCH, M., ASHEIM, B., ISAKSEN, A. & NIELSEN, H. 2022. Advancing the treatment of human agency in the analysis of regional economic development: Illustrated with three Norwegian cases. *Growth and Change*, **53**, 248–275, 10.1111/grow.12583.

GRILLITSCH, M., ASHEIM, B. & NIELSEN, H. 2021. Temporality of agency in regional development. *European Urban and Regional Studies*, **29**, 107–125, 10.1177/09697764211028884.

GRILLITSCH, M., REKERS, J., ASHEIM, B., FITJAR, R.D., HAUS-REVE, S., KOLEHMAINEN, J., KURIKKA, H., et al. 2024. Patterns of opportunity spaces and agency across regional contexts: Conditions and drivers for change. *Environment and Planning A: Economy and Space*, **0**, 10.1177/0308518X241303636.

GRILLITSCH, M. & SOTARAUTA, M. 2025. Agency and structure in regional development: in search of a social science research programme. *European Planning Studies*, **33**, 104–123, 10.1080/09654313.2024.2415125.

GRILLITSCH, M. & SOTARAUTA, M. 2019. Trinity of change agency, regional development paths and opportunity spaces. *Progress in Human Geography*, **XX**, 1–20, 10.1177/0309132519853870.

HABERL, H., WIEDENHOFER, D., VIRÁG, D., KALT, G., PLANK, B., BROCKWAY, P., FISHMAN, T., et al. 2020. A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: Synthesizing the insights. *Environmental Research Letters*, **15**, 10.1088/1748-9326/ab842a.

HAMPTON, S., BLUNDEL, R., EADSON, W., NORTHALL, P. & SUGAR, K. 2023. Crisis and opportunity: Transforming climate governance for SMEs. *Global Environmental Change*, **82**, 1–6, 10.1016/j.gloenvcha.2023.102707.

HANKAMMER, S., KLEER, R., MÜHL, L. & EULER, J. 2021. Principles for organizations striving for sustainable degrowth: Framework development and application to four B Corps. *Journal of Cleaner Production*, **300**, 126818, 10.1016/j.jclepro.2021.126818.

HANSEN, T. & COENEN, L. 2017. Unpacking resource mobilisation by incumbents for biorefineries: the role of micro-level factors for technological innovation system weaknesses. *Technology Analysis and Strategic Management*, **29**, 500–513, 10.1080/09537325.2016.1249838.

HARGRAVE, T.J. & VAN DE VEN, A.H. 2006. A collective action model of institutional innovation. *Academy of Management Review*, **31**, 864–888.

HASSEL, A.-V., SCHILLER, D., SEIBERLING, S., THEEL, C. & FLEßA, S. eds. 2024. *Bioökonomie und regionaler Strukturwandel*. Wiesbaden: Springer Fachmedien Wiesbaden, 10.1007/978-3-658-42358-2.

HASSINK, R. 2010. Locked in decline? On the role of regional lock-ins in old industrial areas. *In* Boschma, R. & Marin, R., *eds. The Handbook of Evolutionary Economic Geography*. Cheltenham, Northampton: Edward Elgar, 450–468.

HASSINK, R., ISAKSEN, A. & TRIPPL, M. 2019. Towards a comprehensive understanding of new regional industrial path development. *Regional Studies*, **53**, 1636–1645, 10.1080/00343404.2019.1566704.

HASSINK, R. & KLAERDING, C. 2011. Evolutionary approaches to local and regional development policy. *In* Pike, A., Rodriguez-Pose, A. & Tomaey, J., *eds. Handbook of Local and Regional Development*. Oxon and New York: Routledge, 139–148.

HAYTER, R. & EDENHOFFER, K. 2016. Evolutionary Geography of a Mature Resource Sector: Shakeouts and Shakeins in British Columbia's Forest Industries 1980 to 2008. *Growth and Change*, **47**, 497–519, 10.1111/grow.12155.

HEINIMANN, H.R. & TEISCHINGER, A. 2024. *Forst- und Holzwirtschaft im Wandel*. Berlin, Heidelberg: Springer, 10.1007/978-3-662-69164-9.

HEYEN, D.A. & BROHMANN, B. 2017. Konzepte grundlegenden gesellschaftlichen Wandels und seiner Gestaltung Richtung Nachhaltigkeit - ein Überblick über die aktuelle Transformationsliteratur. *In* Rückert-John, J. & Schäfer, M., *eds. Governance für eine Gesellschaftstransformation. Herausforderungen des Wandels in Richtung nachhaltige Entwicklung.* Wiesbaden: Springer VS, 69–86., 10.1007/978-3-658-16560-4.

HILDEBRANDT, J., HAGEMANN, N. & THRÄN, D. 2017. The contribution of wood-based construction

materials for leveraging a low carbon building sector in europe. *Sustainable Cities and Society*, **34**, 405–418, 10.1016/j.scs.2017.06.013.

HINTON, J. 2021. Five key dimensions of post-growth business: Putting the pieces together. *Futures*, **131**, 102761, 10.1016/j.futures.2021.102761.

HUG, M., MAYER, H. & SEIDL, I. 2022. Transformative enterprises: Characteristics and a definition. *Geography Compass*, **16**, 1–21, 10.1111/gec3.12667.

HUG, M., MAYER, H. & SEIDL, I. 2024. Transformative firm-level agency: A case study of small and medium-sized enterprises (SMEs) in the Swiss wood-processing industry. *Progress in Economic Geography*, **2**, 1–14, 10.1016/j.peg.2024.100020.

ISAKSEN, A., TRIPPL, M. & MAYER, H. 2022. Regional innovation systems in an era of grand societal challenges: reorientation versus transformation. *European Planning Studies*, 1–14, 10.1080/09654313.2022.2084226.

JACKSON, T. 2017. *Prosperity without growth : foundations for the economy of tomorrow*. Second Edi. London and New York: Routledge, 310 pp.

JOLLY, S., GRILLITSCH, M. & HANSEN, T. 2020. Agency and actors in regional industrial path development. A framework and longitudinal analysis. *Geoforum*, **111**, 176–188, 10.1016/j.geoforum.2020.02.013.

JUNGELL-MICHELSSON, J. & HEIKKURINEN, P. 2022. Sufficiency: A systematic literature review. *Ecological Economics*, **195**, 107380, 10.1016/j.ecolecon.2022.107380.

KALLIS, G. 2011. In defence of degrowth. *Ecological Economics*, **70**, 873–880, 10.1016/j.ecolecon.2010.12.007.

KANTON BERN. 2025. Ihr Wald schützt vor Naturgefahren Available at: https://www.weu.be.ch/de/start/themen/umwelt/wald/informationen-waldbesitzer-innen/wald-schutzfunktion.html [Accessed April 17, 2025].

KAPFINGER, O. 2003. *Konstruktive Provokation. Neues Bauen in Vorarlberg.* Vorarlberger Architekturinstitut.

KHMARA, Y. & KRONENBERG, J. 2018. Degrowth in business: An oxymoron or a viable business model for sustainability? *Journal of Cleaner Production*, **177**, 721–731, 10.1016/j.jclepro.2017.12.182.

KLUGE, S. 2000. Empirically Grounded Construction of Types and Typologies in Qualitative Social Research. *Forum Qualitative Social Research* Available at: http://www.qualitative-research.net/fqs/.

KNECHT, T. 2023. Bevölkerung Available at: www.vorarlberg.at/statistik [Accessed August 20, 2024].

KOPATZ, M. 2021. *Wirtschaft ist mehr! Wachstumsstrategien für nachhaltige Geschäftsmodelle in der Region.* München: oekom verlag, 10.14512/9783962388645.

KRISTOF, K. 2017. Change Agents in gesellschaftlichen Veränderungsprozessen. *In Die Experimentalstadt*. Springer Fachmedien Wiesbaden, 165–179., 10.1007/978-3-658-14981-9_9.

KRISTOF, K. 2021. Erfolgsfaktoren für die gesellschaftliche Transformation: Erkenntnisse der Transformationsforschung für erfolgreichen Wandel nutzen. *GAIA - Ecological Perspectives for Science and Society*, **30**, 7–11, 10.14512/gaia.30.1.3.

KRISTOF, K. 2010. *Wege zum Wandel: Wie wir gesellschaftliche Veränderungen erfolgreicher gestalten können*. 1. Auflage. München: Oekom Verlag, 160 pp.

KUCKARTZ, U. 2010. Typenbildung. *In* Mey, G. & Mruck, K., *eds. Handbuch Qualitative Forschung*

in der Psychologie. VS Verlag für Sozialwissenschaften, 553–568.

KYLLINGSTAD, N. 2020. *The role of firm-level actors and systemlevel actors in processes of new regional industrial path development*. Dissertation, University of Agder, 146 pp.

KYLLINGSTAD, N. & RYPESTØL, J.O. 2019. Towards a more sustainable process industry: A single case study of restructuring within the Eyde process industry cluster. *Norsk Geografisk Tidsskrift*, **73**, 29–38, 10.1080/00291951.2018.1520292.

LAND VORARLBERG. 2025a. Schutzwald. Unser Bergwald - Schutzschild vor Naturgefahren Available at: https://vorarlberg.at/-/schutzwald-naturgefahren [Accessed April 17, 2025].

LAND VORARLBERG. 2025b. Waldpädagogik Available at: https://vorarlberg.at/-/waldpaedagogik [Accessed April 22, 2025].

LANGE, B., HÜLZ, M., SCHMID, B. & SCHULZ, C. eds. 2020. *Postwachstumsgeographien. Raumbezüge diverser und alternativer Ökonomien*. Bielefeld, Germany: transcript Verlag, 10.14361/9783839451809.

LANGE, J., BEST, B., FROESE, T. & ZELL-ZIEGLER, C. 2024. Policy-Making as a Crucial Element for Sufficiency on the Business Level. Discussing the Role of Policies to Push Sufficiency beyond Pioneers. *In* Gossen, M. & Niessen, L., *eds. Sufficiency in Business. The Transformative Potential of Business for Sustainability*. Bielefeld, Germany: transcript Verlag, 325–340., 10.14361/9783839469101.

LANGE, S. 2013. Unternehmen haben wenig Spielraum. *Ökologisches Wirtschaften*, **28**, 25, 10.14512/oew.v28i1.1256.

LEHNER, L., KINNUNEN, H., WEIDNER, U., LEHNER, J., PAULI, B. & MENK, J. 2014. *Branchenanalyse. Analyse und Synthese der Wertschöpfungskette (WSK) Wald und Holz in der Schweiz. Technischer Bericht im Auftrag des Bundesamtes für Umwelt BAFU, finanziert durch den Aktionsplan Holz.* Abensberg, 314 pp.

LEHNER, L., PAULI, B., WEIDNER, U. & BURKHARDT, A. 2003. Struktur- und Potenzialanalyse der Schweizer Sägeindustrie. Abschlussbericht, 1–243 pp.

LEITUNGSGRUPPE NFP66. 2017. *Programmresümee des Nationalen Forschungsprogramms NFP66 "Ressource Holz."* Bern, 26 pp.

LIESEN, A., DIETSCHE, C. & GEBAUER, J. 2015. SUCCESSFUL NON-GROWING COMPANIES. 1–32.

LIESEN, A., DIETSCHE, C. & GEBAUER, J. 2013. Wachstumsneutrale Unternehmen. Pilotstudie zur Unternehmensperspektive im Postwachstumsdiskurs. *Schriftenreihe des IÖW 205/13*, 38.

LIGNUM BERN. 2025a. Regionale Wertschöpfung Wald und Holz Available at: https://lignumbern.ch/wyssacademy/ [Accessed January 20, 2025].

LIGNUM BERN. 2025b. Wyss Academy: Überblick über die aktuellen Projekte Available at: https://lignumbern.ch/wyssacademy/projekte/ [Accessed April 18, 2025].

LUND DECLARATION. 2009. The Lund Declaration: Europe must focus on the grand challenges of our time. 1–2 Available at: http://www.vr.se/download/18.7dac901212646d84fd38000336/.

LÜTHI, T. 2021. *Branchenspiegel Wal- und Holzwirtschaft Kanton Bern Ausgabe 2020/21*. Spiez, 1–19 pp. Available at: https://lignumbern.ch/wp-content/uploads/2021/07/2021.03.22-Final_PDF_quer_Branchenspiegel_InitiativeHolzBE.pdf [Accessed September 20, 2024].

LÜTHI, T. 2020. *Branchenspiegel Wald- und Holzwirtschaft Kanton Bern*. Spiez, 16 pp.

LÜTHI, T., GAUTSCHI, M. & LÄDRACH, T. 2019. Zur aktuellen Lage der Schweizer Holzindustrie.

Holz-Zentralblatt, **33**, 718–719.

MAAS, G. & JONES, P. eds. 2019. *Transformational Entrepreneurship Practices*. Cham: Springer International Publishing, 10.1007/978-3-030-11524-1.

MACKINNON, D., DAWLEY, S., PIKE, A. & CUMBERS, A. 2019a. Rethinking Path Creation: A Geographical Political Economy Approach. *Economic Geography*, **95**, 113–135, 10.1080/00130095.2018.1498294.

MACKINNON, D., DAWLEY, S., STEEN, M., MENZEL, M.P., KARLSEN, A., SOMMER, P., HANSEN, G.H. & NORMANN, H.E. 2019b. Path creation, global production networks and regional development: A comparative international analysis of the offshore wind sector. *Progress in Planning*, **130**, 1–32, 10.1016/j.progress.2018.01.001.

MARKARD, J., RAVEN, R. & TRUFFER, B. 2012. Sustainability transitions: An emerging field of research and its prospects. *Research Policy*, **41**, 955–967, 10.1016/j.respol.2012.02.013.

MARTIN, H., GRUNDEL, I. & DAHLSTRÖM, M. 2023. Reconsidering actor roles in regional innovation systems: transformative industrial change in the forest-based bioeconomy. *Regional Studies*, 10.1080/00343404.2022.2151581.

MARTIN, R. 2000. Institutional Approaches in Economic Geography. *In* Sheppard, E. & Barnes, T.J., *eds. A Companion to Economic Geography*. Malden, Oxford and Victoria: Blackwell Publishing Ltd, 77–94.

MARTIN, R. 2014. Path Dependence and the Spatial Economy: A Key Concept in Retrospect and Prospect. *In* Fischer, M.M. & Nijkamp, P., *eds. Handbook of Regional Science*. Berlin, Heidelberg: Springer Berlin Heidelberg, 609–629., 10.1007/978-3-642-23430-9_34.

MARTIN, R. 2021. Rebuilding the economy from the Covid crisis: time to rethink regional studies? *Regional Studies, Regional Science*, **8**, 143–161, 10.1080/21681376.2021.1919191.

MARTÍNEZ-ALIER, J., PASCUAL, U., VIVIEN, F.D. & ZACCAI, E. 2010. Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm. *Ecological Economics*, **69**, 1741–1747, 10.1016/j.ecolecon.2010.04.017.

MAURER, C. 2024. A Taxonomy of Corporate Sufficiency Strategies. Exploring Driving Factors for Sufficiency in Business. *In* Gossen, M. & Niessen, L., *eds. Sufficiency in Business. The Transformative Potential of Business for Sustainability*. Bielefeld, Germany: transcript Verlag, 43–64., 10.14361/9783839469101.

MAURER, C. 2017. *Beseelte Unternehmerinnen*. Bern: Zytglogge, 208 pp.

MAYER, H. 2020. Slow Innovation in Europe's Peripheral Regions: Innovation beyond Acceleration. *In* Döringer, S. & Eder, J., *eds. Schlüsselakteure der Regionalentwicklung: Welche Perspektiven bietet Entrepreneurship für ländliche Räume?* Wien: Verlag der östereichischen Akademie der Wissenschaften, 9–22.

MAYER, H., MEILI, R. & MORISSON, A. 2021a. *Wissenschaftlcihe Grundlagen der Neuen Regionalpolitik. Bericht und Management Response*. Bern.

MAYER, H., TSCHUMI, P., PERREN, R., SEIDL, I., WINIGER, A. & WIRTH, S. 2021b. How do social innovations contribute to growth-independent territorial development? Case studies from a Swiss mountain region. *Die Erde*, **152**, 218–231, https://doi.org/10.12854/erde-2021-592.

MAYRING, P. & FENZL, T. 2019. Qualitative Inhaltsanalyse. *In* Baur, N. & Blasius, J., *eds. Handbuch Methoden der empirischen Sozialforschung*. Wiesbaden: Springer Fachmedien Wiesbaden, 633–648., 10.1007/978-3-658-21308-4.

MEADOWS, D.H.;, MEADOWS, D.L.;, RANDERS, J. & BEHRENS III, W.W. 1972. *The Limits to Growth. A Report for THE CLUB OF ROME'S Project on the Predicament of Mankind*. New York: Universe Books.

MEILI, R. & MAYER, H. 2024. The evolution of regional policy in Switzerland: From a growth oriented to a challenge-led policy? *Local Economy*, 10.1177/02690942241282273.

MIÖRNER, J. 2022. Contextualizing agency in new path development: how system selectivity shapes regional reconfiguration capacity. *Regional Studies*, **56**, 592–604, 10.1080/00343404.2020.1854713.

MORISSON, A. & MAYER, H. 2021. An agent of change against all odds? The case of Ledger in Vierzon, France. *Local Economy: The Journal of the Local Economy Policy Unit*, **36**, 430–447, 10.1177/02690942211052014.

MÜLLER, M. 2013. Mittendrin statt nur dabei: Ethnographie als Methodologie in der Humangeographie. *Geographica Helvetica*, **67**, 179–184, 10.5194/gh-67-179-2012.

MULLER, P., DEVNANI, S., LADHER, R., CANNINGS, J., MURPHY, E., ROBIN, N., ILLAN, S.R., et al. 2021. *Annual Report on European SMEs 2020/2021*. Brussels, 1–175 pp. Available at: https://ec.europa.eu/docsroom/documents/46062.

MURPHY, J.T. & SCHINDLER, S. 2011. Globalizing development in Bolivia? Alternative networks and value-capture challenges in the wood products industry. *Journal of Economic Geography*, **11**, 61–85, 10.1093/jeg/lbp059.

NESTEROVA, I. 2020. Degrowth business framework: Implications for sustainable development. *Journal of Cleaner Production*, **262**, 1–10, 10.1016/j.jclepro.2020.121382.

NESTEROVA, I. 2021. Small firms as agents of sustainable change. *Futures*, **127**, 102705, 10.1016/j.futures.2021.102705.

NILSEN, T., CALIGNANO, G., LIEN, S. & NORDLI, A.J. 2024. Norwegian wood, isn't it good? Narratives of the lumber industry and development paths in the Nordic periphery. *Journal of Rural Studies*, **105**, 103182, 10.1016/j.jrurstud.2023.103182.

NORTH, D.C. 1991. Institutions. *Journal of Economic Perspectives*, **5**, 97–112.

NORTH, P. 2016. The business of the Anthropocene? Substantivist and diverse economies perspectives on SME engagement in local low carbon transitions. *Progress in Human Geography*, **40**, 437–454, 10.1177/0309132515585049.

NORTH, P. & NURSE, A. 2014. 'War Stories': Morality, curiosity, enthusiasm and commitment as facilitators of SME owners' engagement in low carbon transitions. *Geoforum*, **52**, 32–41, 10.1016/j.geoforum.2013.12.007.

OECD. 2024. Monthly comparative price levels. *OECD Data Explorer* Available at: https://data-explorer.oecd.org/vis?tm=monthly%20comparative%20price%20levels&pg=0&snb=3&vw=ov&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_PPP_M%40DF_PP_CPL_M&df[ag]=OECD.SDD.TPS&df[vs]=1.0&dq=CHE%2BAUT.M....&to[TIME_PERIOD]=false&pd=2024-09%2C [Accessed November 13, 2024].

O'NEILL, K. & GIBBS, D. 2016. Rethinking green entrepreneurship – Fluid narratives of the green economy. *Environment and Planning A*, **48**, 1727–1749, 10.1177/0308518X16650453.

PALZKILL, A. & AUGENSTEIN, K. 2017. Business model resilience – understanding the role of companies in societal transformation processes. *uwf UmweltWirtschaftsForum*, **25**, 61–70, 10.1007/s00550-017-0458-3.

PASTAKIA, A. 1998. Grassroots ecopreneurs: change agents for a sustainable society. *Journal of Organizational Change Management*, **11**, 157–173.

PAULI-KRAFFT, U., SUTER, C.-L. & AEBISCHER, C. 2021. Ressourcenpolitik Holz 2030. Strategie, Ziele und Aktionsplan Holz 2021 - 2026. *Umwelt-Info Nr. 2103* Available at: www.bafu.admin.ch/ui-2103-d [Accessed October 3, 2023].

PFRIEM, R. 2021. Transformative Unternehmen und die Veränderung der Unternehmenslandschaft. *In Die Neuerfindung des Unternehmertums. Solidarische Ökonomie, radikale Demokratie und kulturelle Evolution*. Marburg: Metropolis-Verlag, 265–300.

PFRIEM, R., ANTONI-KOMAR, I. & LAUTERMANN, C. 2015. Transformative Unternehmen. *Ökologisches Wirtschaften - Fachzeitschrift*, **30**, 18, 10.14512/oew300318.

PIKE, A., MACKINNON, D., CUMBERS, A., DAWLEY, S. & MCMASTER, R. 2016. Doing evolution in economic geography. *Economic Geography*, **92**, 123–144, 10.1080/00130095.2015.1108830.

PIKE, A., RODRÍGUEZ-POSE, A. & TOMANEY, J. 2007. What Kind of Local and Regional Development and for Whom? *Regional Studies*, **41**, 1253–1269, 10.1080/00343400701543355.

POLANYI, K. 2001. *The Great Transformation: The Political and Economic Origins of Our Time*. 2nd editio. Boston: Beacon Press, 360 pp.

POSSE, D. 2015. *Zukunftsfähige Unternehmen in einer Postwachstumsgesellschaft*. Heidelberg: Vereinigung für Ökologische Ökonomie e.V., 132 pp.

PRATT, G. 2009. Positionality Gregory, D., Johnston, R., Pratt, G., Watts, M.J. & Whatmore, S., *eds. The Dictionary of Human Geography*, 556–557.

PROHOLZ AUSTRIA. 2025. Regionen und Gemeinden stärken. Vielfältige Lösungswege, kleine und grosse Eingriffe aus Holz gegen Strukturschwächen. *zuschnitt 95*, 1–28.

RAFFAELLI, R. & GLYNN, M.A. 2015. Institutional Innovation: novel, useful, and legitimate. *In* Zhou, J., *ed. The Oxford Handbook of Creativity, Innovation, and Entrepreneurship*. OxfordUniversityPress.

REGIONALENTWICKLUNG VORARLBERG EGEN & TELESIS GMBH. 2018. Holzcluster Vorarlberg. Regionaler Clusterstudienbericht Available at: http://data.regio-v.at/CaSCo/DT411-CaSCo_Regio-V_clusterstudyreport_final.pdf [Accessed February 5, 2024].

REGIOSUISSE. 2025a. NRP-Mehrjahresprogramm 2024–2031 Available at: https://regiosuisse.ch/programme/nrp/2024-2031 [Accessed March 20, 2025].

REGIOSUISSE. 2025b. regiosuisse-Projektdatenbank Regionalentwicklung Available at: https://regiosuisse.ch/projects-nrp [Accessed February 25, 2025].

RICHARDSON, K., STEFFEN, W., LUCHT, W., BENDTSEN, J., CORNELL, S.E., DONGES, J.F., DRÜKE, M., et al. 2023. Earth beyond six of nine planetary boundaries. *Science Advances*, **9**, 1–16, 10.1126/sciadv.adh2458.

RÜCKER, E., KRAMMER, D., HOCH, I., PAUL, S., MATHIS, T., TOMASELLI, K., MARLIN, A., HAGSPIEL, E., KORIZEK, C. & LITMEYER, M.-L. 2018. Strukturdaten Vorarlberg 2018 Available at: https://vorarlberg.at/documents/302033/472382/Strukturdaten2018.pdf/170ce4ac-0743-f82f-366f-75d2628165cc?t=1616165007849 [Accessed August 20, 2024].

SCHALTEGGER, S. 2002. A Framework for Ecopreneurship. Leading Bioneers and Environmental Managers to Ecopreneurship. *Environmental Entrepreneurship*, 45–58.

SCHMELZER, M. & VETTER, A. 2019. *Degrowth/Postwachstum zur Einführung*. Hamburg: Junius Verlag GmbH, 256 pp.

SCHMID, B. 2020. *Making Transformative Geographies*. Bielefeld, Germany: transcript Verlag, 10.14361/9783839451403.

SCHNEIDEWIND, U. 2019. *Die Grosse Transformation: eine Einführung in die Kunst gesellschaftlichen Wandels*. 3. Auflage. Frankfurt am Main: Fischer Taschenbuch, 528 pp.

SCHNEIDEWIND, U., PALZKILL, A. & SCHECK, H. 2012. Der Beitrag von Unternehmen zur großen Transformation. *In* Hahn, R., Janzen, H. & Matten, D., *eds. Die gesellschaftliche Verantwortung des Unternehmens: Hintergründe, Schwerpunkte und Zukunftsperspektiven*. Stuttgart: Schäffer-Poeschel, 497–528.

SCHNEIDEWIND, U., SINGER-BRODOWSKI, M., AUGENSTEIN, K. & STELZER, F. 2016. Pledge for a transformative science: a conceptual framework. *Wuppertal papers*, **191**, 28, ISSN 0949-5266.

SCHNEIDEWIND, U. & ZAHRNT, A. 2017. *Damit gutes Leben einfacher wird. Perspektiven einer Suffizienzpolitik*. third edition. München: oekom, 1–171 pp.

SCHOENBERGER, E. 1991. The corporate interview as a research method in economic geography. *Professional Geographer*, **43**, 180–189, 10.1111/j.0033-0124.1991.00180.x.

SCHOLL, G. & MEWES, H. 2015. Unternehmen als Mitgestalter sozial-ökologischer Transformation: Thesen des Instituts für ökologische Wirtschaftsforschung (IÖW). *Ökologisches Wirtschaften - Fachzeitschrift*, **30**, 15, 10.14512/oew300315.

SCHULZ, C. 2012. Post-wachstums-ökonomien - (K)ein Thema für die Wirtschaftsgeographie? *Zeitschrift für Wirtschaftsgeographie*, **56**, 264–273, 10.1515/zfw.2012.0018.

SCHULZ, C. & BAILEY, I. 2014. The green economy and post-growth regimes: Opportunities and challenges for economic geography. *Geografiska Annaler, Series B: Human Geography*, **96**, 277–291, 10.1111/geob.12051.

SCHULZ, C. & BRAUN, B. 2021. Post-growth perspectives in Economic Geography. *Die Erde*, **4**, 213–217.

SCHULZ, C., LANGE, B., HÜLZ, M. & SCHMID, B. 2020. Postwachstumsgeographien. Konzeptionelle und thematische Eckpunkte der Anthologie. *In* Lange, B., Hülz, M., Schmid, B. & Schulz, C., *eds. Postwachstumsgeographien. Raumbezüge diverser und alternativer Ökonomien*. Bielefeld, Germany: transcript Verlag., 10.14361/9783839451809.

SCHWEIZERISCHER NATIONALFONDS. 2025. Nationales Forschungsprogramm Baukultur NFP81 Available at: https://www.nfp81.ch/de [Accessed April 3, 2025].

SCRIMBER CSC. 2025. Scrimber - ein Beitrag zum Klimaschutz Available at: https://www.scrimber.com [Accessed March 21, 2025].

SEGESSEMANN, A. & CREVOISIER, O. 2016. Beyond Economic Base Theory: The Role of the Residential Economy in Attracting Income to Swiss Regions. *Regional Studies*, **50**, 1388–1403, 10.1080/00343404.2015.1018882.

SEIDL, I. & ZAHRNT, A. 2019. Neugewichtung von Erwerbsarbeit und Tätigsein für eine Postwachstumsgesellschaft. *Ökologisches Wirtschaften*, **1**, 17–18, 10.14512/OEW340117.

SEIDL, I. & ZAHRNT, A. eds. 2010. *Postwachstumsgesellschaft: Konzepte für die Zukunft*. Marburg: Metropolis-Verlag, 247 pp.

SOTARAUTA, M., SUVINEN, N., JOLLY, S. & HANSEN, T. 2021. The many roles of change agency in the game of green path development in the North. *European Urban and Regional Studies*, **28**, 92–110, 10.1177/0969776420944995.

STATISTA. 2024a. Bruttoinlandprodukt (BIP) pro Kopf in Österreich nach Bundesländern im Jahr 2023

Available at: https://de.statista.com/statistik/daten/studie/703733/umfrage/bruttoinlandsprodukt-bip-pro-kopf-in-oesterreich-nach-bundeslaendern/ [Accessed February 26, 2025].

STATISTA. 2024b. Bruttoinlandprodukt (BIP) pro Kopf in Vorarlberg von 2012 bis 2022 Available at: https://de.statista.com/statistik/daten/studie/1270719/umfrage/bruttoinlandsprodukt-bip-pro-kopf-in-vorarlberg/ [Accessed September 20, 2024].

STATISTA. 2023. Bruttoinlandsprodukt (BIP) pro Kopf in der Schweiz nach Kantonen im Jahr 2021 Available at: https://de.statista.com/statistik/daten/studie/442774/umfrage/bruttoinlandsprodukt-bip-pro-kopf-in-der-schweiz-nach-kantonen/ [Accessed February 26, 2025].

STERN, D.I. 1997. The capital theory approach to sustainability: A critical appraisal. *Journal of Economic Issues*, **31**, 145–173, 10.1080/00213624.1997.11505895.

STRUNZ, S. & SCHINDLER, H. 2018. Identifying Barriers Toward a Post-growth Economy – A Political Economy View. *Ecological Economics*, **153**, 68–77, 10.1016/j.ecolecon.2018.06.017.

STUDER, M. & POLDERVAART, P. 2017. *Neue Wege zur holzbasierten Bioraffinerie. Nationales Forschungsprogramm NFP 66 Ressource Holz*. Bern, 54 pp.

SUTER, N. 2024. *Transformative Unternehmen: Entwicklung einer standardisierten Umfrage zur Bestimmung des transformativen Charakters von klein- und mittelgrossen Unternehmen*. Bachelor Thesis, Bern: University of Bern, 1–184 pp.

S-WIN. 2020. Swiss Wood Innovation Network Aspekte 2020.

S-WIN. 2021. Swiss Wood Innovation Network Aspekte 2021.

TAVERNA, R., HOFER, P., WERNER, F., KAUFMANN, E. & THÜRIG, E. 2007. The CO2 Effects of the Swiss Forestry and Timber Industry. Scenarios of future potential for climate-change mitigation. *Environmental studies no. 0739*, 102.

TÖDTLING, F. & TRIPPL, M. 2005. One size fits all? Towards a differentiated regional innovation policy approach. *Research Policy*, **34**, 1203–1219, 10.1016/j.respol.2005.01.018.

TÖDTLING, F., TRIPPL, M. & DESCH, V. 2021. New directions for RIS studies and policies in the face of grand societal challenges. *European Planning Studies*, **0**, 1–18, 10.1080/09654313.2021.1951177.

TRIPPL, M. 2023. Challenge-oriented regional innovation systems and strategies for sustainability transitions. *In* Schwaag Serger, S., Soete, L. & Stierna, J., *eds. The Square: Putting place-based innovation policy for sustainability at the center of policymaking*. European Commission Joint Research Centre., 10.2760/575800.

TRIPPL, M., BAUMGARTINGER-SEIRINGER, S., FRANGENHEIM, A., ISAKSEN, A. & RYPESTØL, J.O. 2020. Unravelling green regional industrial path development: Regional preconditions, asset modification and agency. *Geoforum*, **111**, 189–197, 10.1016/j.geoforum.2020.02.016.

TRIPPL, M., BAUMGARTINGER-SEIRINGER, S. & KASTRUP, J. 2024a. Challenge-oriented regional innovation systems: towards a research agenda. *Investigaciones Regionales - Journal of Regional Research*.

TRIPPL, M., FASTENRATH, S. & ISAKSEN, A. 2024b. Rethinking regional economic resilience: Preconditions and processes shaping transformative resilience. *European Urban and Regional Studies*, **31**, 101–115, 10.1177/09697764231172326.

TRUBERHOLZ. 2025. Truberholz: Holzbau Available at: https://www.truberholz.ch/de/holzbau [Accessed March 21, 2025].

TSCHUMI, P., WINIGER, A., WIRTH, S., MAYER, H. & SEIDL, I. 2020. Wachstumsunabhängigkeit

durch Soziale Innovationen? Eine Analyse potenzieller Wachstumswirkungen von Sozialen Innovationen im Schweizer Berggebiet. *In* Lange, B., Hülz, M., Schmid, B. & Schulz, C., *eds. Postwachstumsgeographien. Raumbezüge diverser und alternativer Ökonomien.* Bielefeld: transcript Verlag, 117–137., 10.14361/9783839451809.

UNEP. 2022. Kunming-Montreal Global Biodiversity Framework. 1–15 Available at: https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf [Accessed February 25, 2025].

UTHEALTH SCHOOL OF PUBLIC HEALTH. 2024. Systematic Review Resources: Systematic Review Overview Available at: https://libguides.sph.uth.tmc.edu/c.php?g=543382&p=5375107 [Accessed April 21, 2025].

VAN DEN BERGH, J.C.J.M. & KALLIS, G. 2012. Growth, a-growth or degrowth to stay within planetary boundaries? *Journal of Economic Issues*, **46**, 909–920, 10.2753/JEI0021-3624460404.

VINCENT, S. & O'MAHONEY, J. 2018. Critical Realism and Qualitative Research: An Introductory Overview. *In* Cassel, C., Cunliffe, A.L. & Grandy, G., *eds. The SAGE Handbook of Qualitative Business and Management Research Methods: History and Traditions*. London: SAGE Publications Ltd, 201–216., 10.4135/9781526430212.n13.

VON HIPPEL, E. 2016. User Innovation. *In The Palgrave Encyclopedia of Strategic Management*. Palgrave Macmillan UK, 1–6., 10.1057/978-1-349-94848-2_380-1.

WACHTER, D. 2014. *Kompaktwissen Nachhaltige Entwicklung*. 4th ed. Glarus and Chur: Somedia Buchverlag, 1–193 pp.

WAGNER, M. & SCHALTEGGER, S. 2010. Classifying Entrepreneurship for the Public Good: Empirical Analysis of a Conceptual Framework. *Journal of Small Business & Entrepreneurship*, **23**, 431–443, 10.1080/08276331.2010.10593494.

WALLEY, L. & TAYLOR, D. 2002. Opportunists, Champions, Mavericks ...? A Typology of Green Entrepreneurs. *Greener Management International*, **38**, 31–43.

WBGU. 2011a. *Hauptgutachten. Welt im Wandel: Gesellschaftsvertrag für eine Große Transformation*. 2. Auflage. Berlin: Wissenschaftlicher Beirat Globale Umweltveränderungen (WGBU), 422 pp.

WBGU. 2011b. *World in Transition. A Social Contract for Sustainability*. Berlin: German Advisory Council on Global Change WBGU, 396 pp.

WCED. 1987. Our Common Future. Report of the World Commission on Environment and Development, 1–247 pp. Available at: https://www.are.admin.ch/dam/are/de/dokumente/nachhaltige_entwicklung/dokumente/bericht/our_common_futurebrundtlandreport1987.pdf.download.pdf/our_common_futurebrundtlandreport1987.pdf [Accessed April 9, 2025].

WELLER, S. & BEER, A. 2022. State structures and the limits of agency: governing the transformation from coal in Australia. *Regional Studies*, 10.1080/00343404.2022.2047918.

WIEFEK, J. & HEINITZ, K. 2018. Common good-oriented companies: Exploring corporate values, characteristics and practices that could support a development towards degrowth. *Management Revue*, **29**, 311–331, 10.5771/0935-9915-2018-3-311.

WIRTH, DAMIAN, ORTLIEB, C. & DEMIÈRE, J. 2023. INSIGHTS: WEGE ZUR NACHHALTIGKEIT. Pioniere gewähren wertvolle Einblicke in ihr Nachhaltigkeits-Management. Studienbericht, 1–77 pp.

WIRTH, SAMUEL, TSCHUMI, P., MAYER, H. & BANDI TANNER, M. 2023. Change agency in social

innovation: an analysis of activities in social innovation processes. *Regional Studies, Regional Science*, **10**, 33–51, 10.1080/21681376.2022.2157324.

WITTMAYER, J. & HÖLSCHER, K. 2017. *Transformationsforschung. Definitionen, Ansätze, Methoden.* Dessau-Rosslau, 125 pp. Available at: http://www.umweltbundesamt.de/publikationen.

YEUNG, H.W. 1997. Critical realim and realist research in human geography: a method or a philosophy in search of a method? *Progress in Human Geography*, **21**, 51–74.

YIN, R.K. 2018. *Case Study Research and Applications: Design and Methods*. 6th ed. Los Angeles: Sage Publications.

ZADEMACH, H.-M. & HILLEBRAND, S. eds. 2013. *Alternative Economies and Spaces. New Perspectives for a Sustainable Economy*. Bielefeld: transcript Verlag, 156 pp.

ZAHRNT, A., SEIDL, I., LIESEN, A. & DIETSCHE, C. 2013. Wachstumsneutrale Unternehmensführung. *In* Leitschuh, H., Michelsen, G., Simonis, U.E., Sommer, J. & Weizsäcker, E.U., *eds. Jahrbuch Ökologie 2014. Mut zu Visionen, Brücken in die Zukunft.* Stuttgart: Hirzel, 141–146.

V. APPENDIX

11 Appendix

11.1 Detailed list of indicators for transformative enterprises

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
Values & basic orientation	1 Driving Mission	1.1 Alternative goals	• The founding documents, legal charter or vision statement contain explicit social, cultural and/or environmental goals • Solving social or ecological problems may be part of the business case (business case for sustainability) • Maximizing economic gain/profit is not the raison d'être of the enterprise	• Growth is not a main priority to the enterprise (but the enterprise is not necessarily non-growing) • Success goes beyond business growth	2.1 Sufficiency orientation 7.3 Profit redistribution	Bacq & Janssen, 2011, p.385 Burlingham, 2016, p.xviii; xxix-xxxi De Souza & Seifert, 2018, p.340-343 Deimling, 2016, p.344 Gebauer, Lange & Posse, 2017, p.244f. Gebauer & Ziegler, 2013, p.21 Hankammer et al., 2021, p.8 Johannisova & Frankova 2017, p.5 Khmara & Kronenberg, 2018, p.724 Maurer, 2017 Naumann, 2017, p.10-13 Nesterova, 2020a, p.7 Nesterova, 2020b, p.73f. Nesterova, 2021, p.9-11 Palzkill, Wanner & Markscheffel, 2015, p.71f. Pansera & Fresoli, 2021, p.392 Pfriem, 2021, p.271-288 Posse, 2015, p.66-84 North, 2016, p.448f. Schmid, 2018, p.238 Scholl & Mewes, 2015, p.15-17 Schubring et al., 2013, p.19f. Wiefek & Heinitz, 2018, p.318-326
		1.2 Idealism	• Entrepreneurs are committed to contribute to a better world/economic system	• The enterprise is known for its unconventional way of doing business	9.1 Initiative for value change	Burlingham, 2016, p.xviii; xxix-xxxi

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
			• Environmental/social problems are the key reason for establishing the company • Entrepreneurs are visionary and put their visions into practice • Entrepreneurs strongly identify with their business • Entrepreneurs are aware of the (un)intentional consequences of the enterprises' economic activities along the value chain • The enterprise forgoes activities it judges unsustainable	• Business activities are in line with the values of the enterprise • Business activities do not provoke negative social or environmental impacts	9.2 Initiative for industry change	Deimling, 2016, p.344 Leonhardt, Juschten & Spash, 2017, p.275 Maurer, 2017 Palzkill, Wanner & Markscheffel, 2015, p.71f Palzkill-Vorbeck, 2018, p.36
		1.3 Role model	• Entrepreneurs are or want to be role models for others (firms and people) • The enterprise sets an example for alternative development paths and scopes of action (i.e. alternatives to the dominant growth model)	• Entrepreneurs and their enterprises are environmental/social pioneers	9.1 Initiative for value change 9.2 Initiative for industry change	Deimling, 2016, p.344 Hankammer et al., 2021, p.8 Khmara & Kronenberg, 2018, p.724 Maurer, 2017 Naumann, 2017, p.10-13

	2 Stability & autonomy	2.1 Sufficiency orientation	• Develop alternative user systems and non-owner services (co-production / prosumption, sharing)
			• Engage in non-market production, exchange, or provisioning patterns
			• Relocate value added to the subsistence economy by…
			  ○ fostering self-sufficiency / self-supply / subsistence economies / prosumption
			  ○ teaching manual skills for maintenance and reparation
			  ○ reducing working time, thereby facilitating practices of subsistence, and reducing consumption of employees
			• Do not use (conventional) advertising
			• Regularly review business strategies; implement phases of retreat and reflection for members of the enterprise
				• Decommercialize the production process
				• The business model is not based on permanent growth
				• Have low advertising expenditures
				• Increase the consumers awareness for the production process
				• Encourage the appreciation for craftmanship
				• Low resource use and environmental pollution
					1.1 Alternative goals
					2.5 Limits to growth
					3.1 Low resource use
					3.2 Low environmental pollution
					5.5 Knowledge exchange
					6.4 Service-orientation
					9.1 Initiative for value change
						Bocken & Short, 2016, p.56
						Gebauer & Mewes, 2015, p.37ff.
						Gebauer, 2018, p.232f. & 244ff.
						Gebauer, Lange & Posse, 2017, p.244f.
						Gebauer, Mewes & Dietsche, 2015, p.30f.
						Hankammer et al., 2021, p.8
						Johannisova & Frankova 2017, p.5
						Liesen, Dietsche & Gebauer, 2013, p.26f.
						Liesen, Dietsche & Gebauer, 2015, p.19-23
						Mewes & Gebauer, 2015, p.27-29
						Nesterova, 2020a, p.7
						Nesterova, 2020b, p.73f.
						Nesterova, 2021, p.9-11
						Niessen, 2013, p.42-51
						Paech, 2017, p.298
						Palzkill & Schneidewind, 2013,

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
			• Decelerate the production process (e.g. through artisanal production, long drying and maturation periods of raw materials and products) • Consciously limit their offer in products/services • Forego options to expand sales or to grow otherwise • Reduce the complexity of hierarchy levels of the organization			p.23 Pansera & Fresoli, 2021, p.392 Pfriem, 2015 Pfriem, 2021, p.271-288 Posse, 2015, p.66-84 Reichel, 2013, p.16-18 Schneidewind, Palzkill, Scheck, 2012, p.514-520 Schubring et al., 2013, p.19f. Sommer & Wiefek, 2016, p.5f. Tschumi et al., 2020, p.123-125
		2.2 Long-term orientation	• Pursue the aim to secure the enterprise and jobs in the long run • Maintain stable production capacities and numbers of employees over long periods • Are risk-conscious; may avoid risks (incl. sudden expansion of production, infrastructure, number of employees etc.) • Invest carefully; avoid sudden, extensive growth of production capacities which could threaten the stability of the enterprise	• Make use of strategies that allow keeping employee numbers and production capacities stable during good/difficult times such as… ○ having capacity buffers ○ having flexible work time models ○ implementing a long-term & anticyclical personnel policy ○ partial contracting with partner firms • Business growth is not necessary for the enterprise to survive	2.5 Limits to growth 2.4 Financial independence	Gebauer & Mewes, 2015, p.37ff. Gebauer, Mewes & Dietsche, 2015, p.30f. De Souza & Seifert, 2018, p.340-343 Nesterova, 2021, p.9-11
		2.3 Autonomous management	• The decision-making and management scope remains in the enterprise • The enterprise is self-governed • Avoid growth dependence (but do not necessarily reject growth per se) • Avoid dependence from market fluctuations (e.g. through a diverse customer structure) • Avoid other kinds of dependencies (e.g. on one big customer)	• Entrepreneurs remain in control of how the enterprise develops, they create the kind of firm they want to live in • The enterprise does not have to show growth figures to shareholders • The enterprise does not depend on permanent growth to maintain its internal structure • Diversify their customer structure	2.4 Financial independence	Burlingham, 2016, p.xviii; xxix-xxxi De Souza & Seifert, 2018, p.340-343 Gebauer, 2018, p.240 Liesen, Dietsche & Gebauer, 2013, p.26f. Liesen, Dietsche & Gebauer, 2015, p.19-23 Tschumi et al., 2020, p.123-125
		2.4 Financial independence	• Cover investments and business activities with own resources; do not have debts	• Reduce (fixed) costs e.g. through having…	2.2 Long-term orientation	De Souza & Seifert, 2018, p.340-343

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
			• Have spare financial resources for covering unexpected expenses / surviving times with low demand • Rely on alternative capital providers • Use alternative financing models and currencies • Are in close contact with capital providers (if there are) • Have low shares of foreign capital and interests • Cautious expansion of capacities through new machinery, new buildings, or land purchase	○ low wage differentials ○ a small number of employees ○ low advertisement expenditures ○ low resource use ○ process quality and efficiency measures • Are less vulnerable to short-term market fluctuations • Reduce growth dependence/pressure by preventing dependence on investors/banks to whom they must pay back capital	2.3 Autonomous management 2.5 Limits to growth 5.2 Flat hierarchies 7.1 Low wage differentials	Gebauer, Lange & Posse, 2017, p.244f. Gebauer & Mewes, 2015, p.37ff. Gebauer, Mewes & Dietsche, 2015, p.30f. Leonhardt, Juschten & Spash, 2017, p.275 Liesen, Dietsche & Gebauer, 2013, p.26f. Mewes & Gebauer, 2015, p.27-29 Nesterova, 2021, p.9-11 Niessen, 2013, p.42-51 Paech, 2012, p.293-297 Paech, 2017, p.298 Scholl & Mewes, 2015, p.15-17 Schubring et al., 2013, p.19f. Tschumi et al., 2020, p.123-125 Wiefek & Heinitz, 2018, p.318-326
		2.5 Limits to growth	• Entrepreneur consciously limits firm size and turnover growth • The company follows a non-growing strategy beyond a certain target - in terms of resource use, organizational structures, costs, and sales • The business model is not based on permanent growth	• The enterprise pursues strategies that allow non-growth / growth-independence such as… ○ having limited distribution canals/limiting sales markets ○ not opening new branch operations or stores ○ relying on short and regional supply chains ○ keeping transports to a minimum • avoiding debts	2.1 Sufficiency orientation 2.2 Long-term orientation 2.4 Financial independence 8.1 Regionalization	Burlingham, 2016, p.xviii; xxix-xxxi De Souza & Seifert, 2018, p.340-343 Deimling, 2016, p.344 Gebauer & Mewes, 2015, p.37ff. Gebauer, Mewes & Dietsche, 2015, p.30f. Hinton, 2021, p.3ff. Khmara & Kronenberg, 2018, p.724 Leonhardt, Juschten & Spash, 2017, p.275 Mewes & Gebauer, 2015, p.27-29 Naumann, 2017, p.10-13 Nesterova, 2020b, p.73f. Nesterova, 2021, p.9-11 Niessen, 2013, p.42-51

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
						Pansera & Fresoli, 2021, p.392 Pfriem et al. 2015 Pfriem, 2021, p.271-288 Posse, 2015, p.66-84 Scholl & Mewes, 2015, p.15-17 Schubring et al., 2013, p.19f. Wiefek & Heinitz, 2018, p.318-326
Enterprise strategies	3 Ecological footprint	3.1 Low resource use	• Relates to input dimension of the enterprise • Reduce resource use (process efficiency, technological innovations; frugal use) • Apply circular economy strategies (e.g. close cycles of materials, use recycled/renewable materials, repair and recycle own products, create value from waste) • Use other reduction strategies (sharing models, promote sufficiency etc.)	• Reduce cost expenditure for raw materials • Reduce dependence on volatile markets for raw materials	2.1 Sufficiency orientation 6.2 High quality 6.3 Repairable products 6.4 Service-orientation 6.5 Convivial innovation	Gebauer & Mewes, 2015, p.37ff. Gebauer, 2018, p.232f. & 244ff Gebauer, Lange & Posse, 2017, p.244f.Gebauer, Mewes & Dietsche, 2015, p.30f. Hankammer et al., 2021, p.8 Khmara & Kronenberg, 2018, p.724 Liesen, Dietsche & Gebauer, 2015, p.19-23 Nesterova, 2020a, p.7 Nesterova, 2020b, p.73f. Nesterova, 2021, p.9-11 Pfriem et al. 2015 Wiefek & Heinitz, 2018, p.318-326
		3.2 Low environmental pollution	• Relates to output dimension of the enterprise • Use technological innovations to reduce pollution • Reduce or fully eliminate hazardous wastes from the production process • Reduce energy use and emissions • Use renewable energies • Use recyclable/biodegradable/recycled materials & products	• Reduce cost expenditures for energy and environmental taxes • Are environmental pioneers / cleantech pioneers	2.1 Sufficiency orientation	Gebauer, 2018, p.232f. & 244ff Gebauer, Lange & Posse, 2017, p.244f.Gebauer, Mewes & Dietsche, 2015, p.30f. Hankammer et al., 2021, p.8 Khmara & Kronenberg, 2018, p.724 Liesen, Dietsche & Gebauer, 2015, p.19-23 Nesterova, 2020a, p.7 Nesterova, 2020b, p.73f. Nesterova, 2021, p.9-11 Pfriem et al. 2015 Wiefek & Heinitz, 2018, p.318-326

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
	4 Social obligation	4.1 Care for employees	• Prioritize the well-being of employees • Care for employees exceeds the strict boundaries of work • Ensure the reconcilability of working life and family/unpaid work (e.g. flexible working time/part time jobs; encourage employees to work below normal working time) • Promote work that provides direct personal satisfaction ('meaningful' work, varied work, encourage voluntary work etc.) • Create and offer lasting employment opportunities • Promote the employees' individual responsibility	• A trust-based atmosphere prevails at the workplace • Employees are attached to their work and their workplace • The enterprise is a longstanding employer in the region (does not apply for newly founded enterprises, startups etc.)	8.1 Regionalization	Burlingham, 2016, p.xviii; xxix-xxxi Deimling, 2016, p.344 Gebauer, 2018, p.232f. & 244ff Gebauer, Mewes & Dietsche, 2015, p.30f. Hankammer et al., 2021, p.8 Hinton, 2021, p.3ff. Khmara & Kronenberg, 2018, p.724 Liesen, Dietsche & Gebauer, 2015, p.19-23 Nesterova, 2020a, p.7 Nesterova, 2020b, p.73f. Nesterova, 2021, p.9-11
		4.2 Social inclusiveness	• Promote social inclusion (e.g. through training and employment of disabled, disempowered or delinquent people, cooperation with charities) • Emphasize fairness (e.g. Fair Trade initiatives etc.)	• Are employers for people who 'fell through the cracks' • Backgrounds and skills/skill level of employees are diverse	5.1 Participation	Gebauer, 2018, p.232f. & 244ff. Sommer & Wiefek, 2016, p.5f. Nesterova, 2021, p.9-11
	5 Participatory governance	5.1 Participation	• Employees (and other stakeholders such as subcontractors/suppliers, customers) participate in decision-making • Employees (and other stakeholders) participate in developing the mission statement, new products/services etc.	• There is a participatory control by employees (and other stakeholders, in some cases also local communities) • Employees, customers and suppliers/subcontractors are deeply involved in the enterprise and share its mission	4.2 Social inclusiveness 5.2 Flat hierarchies 5.4 Alternative ownership	Bacq & Janssen, 2011, p.385 Gebauer, Lange & Posse, 2017, p.244f. Gebauer, Mewes & Dietsche, 2015, p.30f. Khmara & Kronenberg, 2018, p.724 Naumann, 2017, p.10-13 Nesterova, 2020a, p.7 Nesterova, 2021, p.9-11 Pfriem et al. 2015 Pfriem, 2021, p.71-88
		5.2 Flat hierarchies	• All employees have an equal say (equality is highly valued) • Decisional power is not based on capital ownership • Governance mechanisms do not prioritize investors (financial concerns) over other stakeholders	• The enterprise experiments with new organizational structures and ownership patterns	2.4 Financial independence 5.1 Participation 5.4 Alternative ownership 7.1 Low wage differentials	Bacq & Janssen, 2011, p.385 Khmara & Kronenberg, 2018, p.724 Naumann, 2017, p.10-13 Nesterova, 2021, p.9-11

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
		5.3 Transparency	• Communicate economic, ecological and social key figures / impact (e.g. eco-balancing; 'Gemeinwohlbilanzierung') • Are transparent about their value/procurement chains • Are transparent about their financing • Are transparent about their performance and advertising (e.g. provide financial information upon request)	• Information on ecological and social performance of the enterprise is available to outsiders	5.5 Knowledge exchange	Dyllick & Muff, 2016, p.166f. Gebauer, 2018, p.232f. & 244ff Gebauer, Mewes & Dietsche, 2015, p.30f. Khmara & Kronenberg, 2018, p.724 Nesterova, 2021, p.9-11 Niessen, 2013, p.42-51 Posse, 2015, p.66-84 Sommer & Wiefek, 2016, p.5f. Tschumi et al., 2020, p.123-125 Wiefek & Heinitz, 2018, p.318-326
		5.4 Alternative ownership	• The enterprise is most likely not a publicly traded shareholder company • The enterprise experiments with uncommon organizational forms	• The enterprise may… ○ …be a collective enterprise, citizens' cooperative, worker-owned/-run cooperative, community-owned enterprise ○ …participate in a "Employee Stock Ownership Program" (ESOP) or foster grassroot economic practice ○ …be self-governed	5.1 Participation 5.2 Flat hierarchies	Gebauer, 2018, p.232f. & 244ff Hinton 2021, p.3ff. Johannisova & Frankova 2017, p.5 Nesterova, 2020a, p.7 Nesterova, 2020b, p.73f. Nesterova, 2021, p.9-11 Pansera & Fresoli, 2021, p.392 Reichel, 2013, p.16-18 Schubring et al., 2013, p.19f. Tschumi et al., 2020, p.123-125 Wiefek & Heinitz, 2018, p.318-326
		5.5 Knowledge exchange	• Exchange professional knowledge and good management practices • Have open-license production, support open-source initiatives	• Contribute to democratizing technology • Reinforce democratic control over technology	2.1 Sufficiency orientation 5.3 Transparency 9.2 Initiative for industry change	Dyllick & Muff, 2016, p.166f. Gebauer, 2018, p.232f. & 244ff Gebauer & Ziegler, 2013, p.21 Hinton, 2021, p.3ff. Khmara & Kronenberg, 2018, p.724 Nesterova, 2020b, p.73f. Nesterova, 2021, p.9-11 Niessen, 2013, p.42-51 Palzkill & Schneidewind, 2013, p.23 Pansera & Fresoli, 2021, p.392

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
						Schubring et al., 2013, p.19f.
	6 Alternative products & services	6.1 Niche markets	• Position themselves and operate in a market niche	• Reduce competitive pressure and thus growth dependence • Firms are (social/ecological) pioneers		Gebauer & Mewes, 2015, p.37ff. Gebauer, Lange & Posse, 2017, p.244f. Gebauer, Mewes & Dietsche, 2015, p.30f. Leonhardt, Juschten & Spash, 2017, p.275 Liesen, Dietsche & Gebauer, 2013, p.26f. Liesen, Dietsche & Gebauer, 2015, p.19-23 Mewes & Gebauer, 2015, p.27-29 Reichel, 2013, p.16-18 Tschumi et al., 2020, p.123-125
		6.2 High quality	• Offer high quality products and services • Design products for long-term use	• Products last longer • Firms are sustainability-oriented quality leaders. They thereby reduce competitive pressure and growth dependence. • Promote sufficient consumption patterns (reduce, reuse, recycle)	3.1 Low resource use	De Souza & Seifert, 2018, p.340-343 Deimling, 2016, p.344 Gebauer & Mewes, 2015, p.37ff. Gebauer, Lange & Posse, 2017, p.244f. Gebauer, Mewes & Dietsche, 2015, p.30f. Khmara & Kronenberg, 2018, p.724 Leonhardt, Juschten & Spash, 2017, p.275 Liesen, Dietsche & Gebauer, 2013, p.26f. Liesen, Dietsche & Gebauer, 2015, p.19-23 Maurer, 2017 Mewes & Gebauer, 2015, p.27-29 Naumann, 2017, p.10-13 Nesterova, 2020a, p.7 Nesterova, 2020b, p.73f. Nesterova, 2021, p.9-11

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
						Paech, 2012, p.293-297 Paech, 2017, p.298 Posse, 2015, p.66-84 Tschumi et al., 2020, p.123-125
		6.3 Repairable products	• Products are repairable (e.g. modular products) • Reject 'planned obsolescence'	• Lower resource throughput / dematerialize production • Promote sustainable consumption patterns (reduce, reuse, recycle	3.1 Low resource use	Bocken & Short, 2016, p.56 Deimling, 2016, p.344 Gebauer, Lange & Posse, 2017, p.244f. Khmara & Kronenberg, 2018, p.724 Liesen, Dietsche & Gebauer, 2015, p.19-23 Nesterova, 2020a, p.7 Nesterova, 2020b, p.73f. Paech, 2012, p.293-297 Paech, 2017, p.298 Posse, 2015, p.66-84
		6.4 Service-orientation	• Services replace the production of new goods (especially in producing firms) • Promote sharing, recycling etc. (dematerialization) • Provide repair services (own repair facilities or provide repair instructions to customers) • Offer maintenance services • Product service systems are part of the business model	• Lower resource throughput / dematerialize production • Promote sustainable consumption patterns (reduce, reuse, recycle, share) • Reduce the pressure to expand production capacities / to invest in new infrastructure and machinery	2.1 Sufficiency orientation 3.1 Low resource use	Bocken & Short, 2016, p.56 Gebauer & Mewes, 2015, p.37ff. Gebauer, Lange & Posse, 2017, p.244f. Gebauer, Mewes & Dietsche, 2015, p.30f. Khmara & Kronenberg, 2918, p.724 Mewes & Gebauer, 2015, p.27-29 Paech, 2012, p.293-297 Posse, 2015, p.66-84 Reichel, 2013, p.16-18 Tschumi et al., 2020, p.123-125
		6.5 Convivial innovation	• Innovations are driven by perceived social or ecological needs • Innovations address social or ecological needs • Product design and use are focused on minimizing resource use • Produce convivial forms of technology	• Experiment with alternative forms of innovation: open innovation, user centered innovation, slow innovation, social innovation etc. • May use simplified technology • Innovation cycles span over several years	3.1 Low resource use 9.1 Initiative for value change 9.2 Initiative for industry change	Bocken & Short, 2016 , p.56 Gebauer, Lange & Posse, 2017, p.244f. Hinton, 2021, p.3ff. Nesterova, 2020a, p.7 Nesterova, 2020b, p.73f. Pansera & Fresoli, 2021, p.392 Scholl & Mewes, 2015, p.15-17

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
Relations with stakeholders	7 People before profit	7.1 Low wage differentials	• Limit wage differentials • Pay fair salaries	• Employees do not feel exploited • Enterprise reduces fixed costs	2.4 Financial independence 5.2 Flat hierarchies 7.3 Profit redistribution	Liesen, Dietsche & Gebauer, 2015, p.19-23 Sommer & Wiefek, 2016, p.5f.
		7.2 Fair prices	• Do not offer dumping prices or quantity discount • Offer long-term and fix acceptance prices	• Fully cover their expenses with income • Reduce the pressure to rationalize, automatize and expand production to make up for low prices; thereby reduce growth dependence		Gebauer, Lange & Posse, 2017, p.244f. Gebauer, Mewes & Dietsche, 2015, p.30f. Tschumi et al., 2020, p.123-125
		7.3 Profit redistribution	• Limit profit distribution to shareholders/owners and rather… • …redistribute profits e.g. through democratically developed salary models or above average salaries • …reinvest financial gains into repairing and maintaining infrastructures • …use profits for social / ecological purposes	• Owners/leaders do not get big personal gain • Shareholder value maximization is not important	1.1 Alternative goals 7.1 Low wage differentials	Bacq & Janssen, 2011, p.385 Gebauer, Mewes & Dietsche, 2015, p.30f. Johannisova & Frankova 2017, p.5 Pfriem et al. 2015 Wiefek & Heinitz, 2018, p.318-326
	8 Regional embeddedness	8.1 Regionalization	• Promote regional production and consumption patterns • Promote regional distribution and provisioning structures (i.e. prefer local suppliers and buyers) • Market their products directly and regionally • Have short and regional value chains; often do without intermediaries • Provide local jobs and are oriented along local needs. • Have a strong and long-term commitment to the local community/their local area • Are dedicated to social and/or environmental issues in the region	• Reduce mobility • Are deeply connected with local communities/the locality in which the firm does its business • May participate in regional currencies • Feel no pressure to expand sales beyond the region, thereby reduce growth dependence • Contribute to flourishing communities through their activities	2.5 Limits to growth 4.1 Care for employees 8.2 Stakeholder proximity	Gebauer, 2018, p.232f. & 244ff. Gebauer, Mewes & Dietsche, 2015, p.30f. Hankammer et al., 2021, p.8 Hinton, 2021, p.3ff. Johannisova & Frankova 2017, p.5 Liesen, Dietsche & Gebauer, 2013, p.26f. Liesen, Dietsche & Gebauer, 2015, p.19-23 Nesterova, 2020a, p.7 Nesterova, 2020b, p.73f. Nesterova, 2021, p.9-11 North, 2016, p.448f.

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
						Paech, 2012, p.293-297 Paech, 2017, p.298 Palzkill & Schneidewind, 2013, p.23 Pfriem et al. 2015 Pfriem, 2021, p.71-88 Posse, 2015, p.66-84 Schneidewind, Palzkill, Scheck, 2012, p.514-520 Sommer & Wiefek, 2016, p.5f. Tschumi et al., 2020, p.123-125 Wiefek & Heinitz, 2018, p.318-326
		8.2 Stakeholder proximity	• Involved stakeholders are in close contact with each other • Integrate stakeholders' needs • Have strong, long-term and personal relationships with their customers • Have partner-like relationships with their suppliers and know them personally (cooperative direct procurement, one-on-one interactions)	• Have a relational organizational identity • Reduce dependency on market dynamics	8.1 Regionalization	Burlingham, 2016, p.xviii; xxix-xxxi De Souza & Seifert, 2018, p.340-343 Gebauer, Lange & Posse, 2017, p.244f. Gebauer, Mewes & Dietsche, 2015, p.30f. Liesen, Dietsche & Gebauer, 2015, p.19-23 Khmara & Kronenberg, p.723f. Nesterova, 2021, p.9-11 Posse, 2015, p.66-84 Reichel, 2013, p.16-18 Schubring et al., 2013, p.19f. Tschumi et al., 2020, p.123-125 Wiefek & Heinitz, 2018, p.318-326
		8.3 Strong cooperation	• Cooperate with other firms and support them (even potential competitors) • Foster structures that rely on and demand cooperation (internal and external) • Collaborate with business partners and stakeholders on solving social and environmental problems together • Build and rely on relationships of trust	• Have an open, transparent, and reliable culture of internal and external cooperation • Exchange employees (capacity buffer) and share infrastructure and machinery; thereby reduce growth dependence		Gebauer, Lange & Posse, 2017, p.244f. Gebauer, Mewes & Dietsche, 2015, p.30f. Hankammer et al., 2021, p.8 Hinton, 2021, p.3ff. Khmara & Kronenberg, 2018, p.724

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
				• The word counts, transactions are agreed orally upon		Liesen, Dietsche & Gebauer, 2015, p.19-23 Mewes & Gebauer, 2015, p.27-29 Nesterova, 2020a, p.7 Nesterova, 2020b, p.73f. Nesterova, 2021, p.9-11 Niessen, 2013, p.42-51 Pfriem et al. 2015 Pfriem, 2021, p.71-88 Scholl & Mewes, 2015, p.15-17 Wiefek & Heinitz, 2018, p.318-326
	9 Change agent	9.1 Initiative for value change	• Encourage employees to share the company values (e.g. reward positive social and environmental performance in personal life) • Carry out educational campaigns on topics of sustainability • Advocate for an 'economy of enoughness' and for reducing consumption and production • Implement alternative reporting standards / metrics of success • Create, are part of or otherwise support environmental/social organizations (in kind and with money) • Involve consumers in company-led initiatives aimed at solving social / environmental problems	• The enterprise is known for taking initiative and pioneering (at least among like-minded people)	1.2 Idealism 1.3 Role model 2.1 Sufficiency orientation 6.5 Convivial innovation	Dyllick & Muff, 2016, p.166f. Gebauer, 2018, p.245 Gebauer, Lange & Posse, 2017, p.244f. Hankammer et al., 2021, p.8 Khmara & Kronenberg, 2018, p.724 Mewes & Gebauer, 2015, p.27-29 Nesterova, 2020a, p.7 Nesterova, 2021, p.9-11 Niessen, 2013, p.42-51 Palzkill & Augenstein, 2017, p.63 Palzkill-Vorbeck, 2018, p.36 Pfriem et al. 2015 Pfriem, 2021, p.71-88 Posse, 2015, p.66-84 Schmid, 2018, p.238
		9.2 Initiative for industry change	• Entrepreneurs are aware of their structural political impact and committed to spreading their vision (e.g. through entrepreneurial adjustment policy, networking with like-minded entrepreneurs, creating networks, creating or influencing industry associations)	• The enterprise is known for taking initiative and pioneering (at least among like-minded people) • Spread their values and ideas of doing business putting 'soft' pressure to suppliers	1.2 Idealism 1.3 Role model 5.5 Knowledge exchange 6.5 Convivial innovation	Dyllick & Muff, 2016, p.166f. Gebauer, 2018, p.245 Khmara & Kronenberg, 2018, p.724 Mewes & Gebauer, 2015, p.27-29 Palzkill & Augenstein, 2017, p.63 Palzkill-Vorbeck, 2018, p.36

	Key Attribute	Indicator	Indicator description	Possible Implications	Related Indicator	References
			• Raise awareness of their transformative impact (e.g. through talks, reports, open house days and other PR activities) • Have a rigorous approach to choosing suppliers who comply with the values of the company • Use power over supply chains to bring sustainability issues forward			Pfriem, 2021, p.71-88 Posse, 2015, p.66-84 Scholl & Mewes, 2015, p.15-17

Full References

BACQ, S. & JANSSEN, F. 2011. The multiple faces of social entrepreneurship: A review of definitional issues based on geographical and thematic criteria. *Entrepreneurship and Regional Development*, **23**, 373–403, 10.1080/08985626.2011.577242.

BOCKEN, N.M.P. & SHORT, S.W. 2016. Towards a sufficiency-driven business model: Experiences and opportunities. *Environmental Innovation and Societal Transitions*, **18**, 41–61, 10.1016/j.eist.2015.07.010.

BURLINGHAM, B. 2016. *Small Giants. Companies That Choose to Be Great Instead of Big*. 10th anniv. New York City: Portfolio, 304 pp.

DE SOUZA, R.R. & SEIFERT, R.E. 2018. Understanding the alternative of not growing for small mature businesses. *Management Revue*, **29**, 333–348, 10.5771/0935-9915-2018-4-333.

DEIMLING, D. 2016. *Sinnstrukturen und Muster nachhaltiger Unternehmen im Kontext der Wachstumskritik - Eine Untersuchung unter Einsatz einer Systemaufstellung*. Müller-Christ, G., *ed.* Wien: LIT Verlag GmbH & Co. KG, 363 pp. Available at: https://premium-cola.de/downloads/wissenschaft/Dissertation_Deimling_Druck.pdf.

DYLLICK, T. & MUFF, K. 2016. Clarifying the Meaning of Sustainable Business: Introducing a Typology From Business-as-Usual to True Business Sustainability. *Organization and Environment*, **29**, 156–174, 10.1177/1086026615575176.

GEBAUER, J. 2018. Towards growth-independent and post-growth-oriented entrepreneurship in the SME sector. *Management Revue*, **29**, 230–256, 10.5771/0935-9915-2018-3-230.

GEBAUER, J., LANGE, S. & POSSE, D. 2017. Wirtschaftspolitik für Postwachstum auf Unternehmensebene: Drei Ansätze zur Gestaltung. *In* Adler, F. & Schachtschneider, U., *eds. Postwachstumspolitiken : Wege zur wachstumsunabhängigen Gesellschaft*. München: Oekom, 239–251.

GEBAUER, J. & MEWES, H. 2015. Qualität und Suffizienz in stabilitätsorientierten KMU. Unternehmensansätze für die Postwachstumsgesellschaft. *uwf UmweltWirtschaftsForum*, **23**, 33–40, 10.1007/s00550-015-0352-9.

GEBAUER, J., MEWES, H. & DIETSCHE, C. 2015. Wir sind so frei. Elf Unternehmen lösen sich vom Wachstumspfad. 36 Available at: https://www.ioew.de/fileadmin/user_upload/BILDER_und_Downloaddateien/Publikationen/2015/Wir_sind_so_frei_-_Elf_Postwachstumspioniere.pdf.

GEBAUER, J. & ZIEGLER, R. 2013. Gemeinsam sind wir groß. Kollaboration als Weg für Postwachstumsunternehmen. *Ökologisches Wirtschaften*, **28**, 21–22, 10.14512/oew.v28i1.1254.

HANKAMMER, S., KLEER, R., MÜHL, L. & EULER, J. 2021. Principles for organizations striving for sustainable degrowth: Framework development and application to four B Corps. *Journal of Cleaner Production*, **300**, 126818, 10.1016/j.jclepro.2021.126818.

HINTON, J. 2021. Five key dimensions of post-growth business: Putting the pieces together. *Futures*, **131**, 102761, 10.1016/j.futures.2021.102761.

JOHANISOVA, N. & FRAŇKOVÁ, E. 2017. Eco-social Enterprises. *In* Spash, C.L., *ed. Routledge handbook of ecological economics: Nature and society*. Abingdon; New York: Routledge, 507–516.

KHMARA, Y. & KRONENBERG, J. 2018. Degrowth in business: An oxymoron or a viable business model for sustainability? *Journal of Cleaner Production*, **177**, 721–731, 10.1016/j.jclepro.2017.12.182.

LEONHARDT, H., JUSCHTEN, M. & SPASH, C.L. 2017. To Grow or Not to Grow? That Is the Question. Lessons for Social Ecological Transformation from Small-Medium Enterprises. *GAIA*, **26**, 269–276, 10.1126/scitranslmed.aar2442.

LIESEN, A., DIETSCHE, C. & GEBAUER, J. 2013. Wachstumsneutrale Unternehmen. Pilotstudie zur Unternehmensperspektive im Postwachstumsdiskurs. *Schriftenreihe des IÖW 205/13*, 38.

LIESEN, A., DIETSCHE, C. & GEBAUER, J. 2015. SUCCESSFUL NON-GROWING COMPANIES. 1–32.

MAURER, C. 2017. *Beseelte Unternehmerinnen*. Bern: Zytglogge, 208 pp.

MEWES, H. & GEBAUER, J. 2015. Transformative Potenziale von Unternehmen, die nicht wachsen wollen. *Ökologisches Wirtschaften - Fachzeitschrift*, **30**, 27, 10.14512/oew300327.

NAUMANN, V. 2017. *Bewusste Begrenzung von Unternehmenswachstum. Strategien und Problemanalyse von Postwachstumsunternehmen am Beispiel von Premium Cola und Quijote*. Universität

Hamburg, 169 pp.
Nesterova, I. 2021. Small firms as agents of sustainable change. *Futures*, **127**, 102705, 10.1016/j.futures.2021.102705.
Nesterova, I. 2020. *Small Business Transition Towards Degrowth*. University of Derby, 346 pp.
Nesterova, I. 2020. Degrowth business framework: Implications for sustainable development. *Journal of Cleaner Production*, **262**, 1–10, 10.1016/j.jclepro.2020.121382.
Niessen, J. 2013. *Pioneering business beyond growth? A multi-case study of small enterprises in Germany*. Universität Freiburg i. Br., 116 pp.
North, P. 2016. The business of the Anthropocene? Substantivist and diverse economies perspectives on SME engagement in local low carbon transitions. *Progress in Human Geography*, **40**, 437–454, 10.1177/0309132515585049.
Paech, N. 2017. Unternehmerische Nachhaltigkeit aus Sicht der Postwachstumsökonomik. *In* Keck, W., *ed. CSR und Kleinstunternehmen*. Berlin: Springer, 287–302., 10.1007/978-3-662-53628-5_20.
Paech, N. 2012. *Nachhaltiges Wirtschaften jenseits von Innovationsorientierung und Wachstum: eine unternehmensbezogene Transformationstheorie*. 2. Auflage. Marburg: Metropolis-Verlag, 491 pp.
Palzkill-Vorbeck, A. 2018. *Geschäftsmodell- Resilienz. Bezugsrahmen für das strategische Verständnis von Unternehmen in gesellschaftlichen Umbruchprozessen.* Wien: Springer Gabler, 214 pp, https://doi.org/10.1007/978-3-658-19644-8.
Palzkill, A. & Augenstein, K. 2017. Business model resilience – understanding the role of companies in societal transformation processes. *uwf UmweltWirtschaftsForum*, **25**, 61–70, 10.1007/s00550-017-0458-3.
Palzkill, A. & Schneidewind, U. 2013. Suffizienz als Business Case. *Ökologisches Wirtschaften*, **28**, 23–24, 10.14512/oew.v28i1.1263.
Palzkill, A., Wanner, M. & Markscheffel, F. 2015. Suffizienz als Geschäftsmodell. *uwf UmweltWirtschaftsForum*, **23**, 69–76, 10.1007/s00550-015-0353-8.
Pansera, M. & Fressoli, M. 2021. Innovation without growth: Frameworks for understanding technological change in a post-growth era. *Organization*, **28**, 380–404, 10.1177/1350508420973631.
Pfriem, R. 2021. Transformative Unternehmen und die Veränderung der Unternehmenslandschaft. *In Die Neuerfindung des Unternehmertums. Solidarische Ökonomie, radikale Demokratie und kulturelle Evolution*. Marburg: Metropolis-Verlag, 265–300.
Pfriem, R., Antoni-Komar, I. & Lautermann, C. 2015. Transformative Unternehmen. *Ökologisches Wirtschaften - Fachzeitschrift*, **30**, 18, 10.14512/oew300318.
Posse, D. 2015. *Zukunftsfähige Unternehmen in einer Postwachstumsgesellschaft*. Heidelberg: Vereinigung für Ökologische Ökonomie e.V., 132 pp.
Reichel, A. 2013. Das Ende des Wirtschaftswachstums, wie wir es kennen. *Ökologisches Wirtschaften*, **28**, 15–18, 10.14512/oew.v28i1.1262.
Schmid, B. 2018. Structured diversity: A practice theory approach to post-growth organisations. *Management Revue*, **29**, 281–310, 10.5771/0935-9915-2018-3-281.
Schneidewind, U., Palzkill, A. & Scheck, H. 2012. Der Beitrag von Unternehmen zur großen Transformation. *In* Hahn, R., Janzen, H. & Matten, D., *eds. Die gesellschaftliche Verantwortung des Unternehmens: Hintergründe, Schwerpunkte und Zukunftsperspektiven*. Stuttgart: Schäffer-Poeschel, 497–528.
Scholl, G. & Mewes, H. 2015. Unternehmen als Mitgestalter sozial-ökologischer Transformation: Thesen des Instituts für ökologische Wirtschaftsforschung (IÖW). *Ökologisches Wirtschaften - Fachzeitschrift*, **30**, 15, 10.14512/oew300315.
Schubring, V., Posse, D., Bozsoki, I. & Buschmann, C. 2013. Unternehmen und Postwachstum: Das Beispiel Premium-Cola. *Ökologisches Wirtschaften*, **28**, 19–20, 10.14512/oew.v28i1.1253.
Sommer, B. & Wiefek, J. 2016. Kein richtiges Leben im falschen? Wachstumsneutrale Unternehmen in der Wachstumswirtschaft. *Beitrag zur Veranstaltung "Neue Trends der Umweltsoziologie" der Sektion Umweltsoziologie – organisiert von Matthias Groß*, 1–10.
Tschumi, P., Winiger, A., Wirth, S., Mayer, H. & Seidl, I. 2020. Wachstumsunabhängigkeit durch Soziale Innovationen? Eine Analyse potenzieller Wachstumswirkungen von Sozialen Innovationen im Schweizer Berggebiet. *In* Lange, B., Hülz, M., Schmid, B. & Schulz, C., *eds. Postwachstumsgeographien. Raumbezüge diverser und alternativer Ökonomien.* Bielefeld: transcript Verlag, 117–137., 10.14361/9783839451809.
Wiefek, J. & Heinitz, K. 2018. Common good-oriented companies: Exploring corporate values, characteristics and practices that could support a development towards degrowth. *Management Revue*, **29**, 311–331, 10.5771/0935-9915-2018-3-311.

11.2 Interview guides for firm interviews (article II)

Identifikation und Beschreibung transformativer Unternehmen

Leitfaden für Firmeninterviews

Gespräch mit:
Unternehmen:
Datum:
Form (online / vor Ort):

Teil	Thema	Inhalt und Fragen	Notizen
Einführung, 2’	Begrüssung	Name Universität, Forschungsgruppe Dann beginnen wir doch gleich…	
	Datenschutz	Einverstanden mit Aufnahme des Gesprächs (als Gedankenstütze)? Aufnahme starten *Bei Annahmen noch einmal mit eingeschalteter Aufnahme: Dann sind Sie also einverstanden, dass das Interview aufgenommen wird. Die Aufnahme wird nur von mir und ausgewählten Mitarbeitenden des Forschungsprojektes verwendet und auf dem Server der Uni Bern gespeichert, auf den nur Mitarbeitende des Forschungsprojektes Zugriff haben. Die Daten können für Publikationszwecke verwendet werden. Für Publikationen werden Sie nicht namentlich genannt (Pseudonymisierung). Bei Zitaten werde ich Sie noch einmal separat anfragen.*	
	Zum Projekt *(auf Nachfrage)*	In meiner Forschung untersuche, welche Rolle Unternehmen in einer nachhaltigeren Zukunft spielen können. Ich analysiere KMUs in der Holzbranche und wie diese sich für die Zukunft wappnen, damit sie auch langfristig überleben können.	
Leitbild und Herausforderungen 20 ’	Vorstellung Interviewpartner*in	Welches ist Ihre Rolle im Unternehmen?	
	Leitbild / Vision	Können Sie mir Ihr Unternehmensleitbild beschreiben? (ev. Rückfragen zu Angaben auf Webseite) Was treibt Sie an und wofür stehen Sie als Unternehmer*in ein?	

	Umsetzung Leitbild *(falls Zeit)*	Experimentieren Sie mit Neuem (Bereich Produkte, DL, Unternehmensorganisation, MA-Führung etc.)?
	Nachhaltigkeit *(falls Zeit)*	Was unternimmt Ihr Unternehmen konkret in Punkto Nachhaltigkeit? Ökologische Aspekte: Zertifizierungen, Labels, Kreislaufwirtschaft, Holz aus Region usw. Wirtschaftliches: Innovation, Finanzierungsmodelle, Wachstum, Positionierung im Markt usw. Soziales: Beziehung und Zusammenarbeit zu MA, zu Kunden und zu Mitbewerbern, reg. Verantwortung
	Herausforderungen, Widersprüche	Welches sind die grössten Herausforderungen, denen Sie als Unternehmer*in gegenüberstehen? Kleinwetterlage (regional, national) Grosswetterlage (global)
	Handlungsspielraum	Können Sie als Unternehmen bzw. als Unternehmer*in in Bezug auf diese Herausforderungen etwas verändern? Können Sie als Unternehmer*in in der Branche Veränderungen in Richtung Nachhaltigkeit anstossen? Wie schätzen Sie da Ihren Handlungsspielraum ein?
Selbsteinschätzung Unternehmer*in 30’	Einführung	Wir kommen nun zum zweiten Teil. Ich werde Ihnen Fragen zu 6 Themenbereichen stellen und Sie bitten, Ihr Unternehmen anhand einer Skala von 1 bis 6 einzuschätzen. Bitte begründen Sie jeweils kurz, weshalb sie eine Zahl wählen.
	Selbsteinschätzung	*Hierzu wird ein separater Fragebogen herangezogen (vergl. Anhang)*.
Schluss, 5-10’	Eckpunkte zum Unternehmen	Ich möchte nun gerne noch ein paar Angaben zu Ihrem Unternehmen ergänzen, die ich auf Ihrer Webseite nicht finden konnte. Geschichte des Unternehmens (Familien-U?) Alter (Gründungsjahr) Seit der Gründung gewachsen? Rechtsform Anzahl MA, Voll- und Teilzeit Produkte und DL Nachhaltigkeit
	Zukunft des Unternehmens	Wie/Wohin möchten Sie sich als Unternehmen in den nächsten ca. 10 Jahren weiterentwickeln?

		Gibt es etwas, was Sie noch sagen möchten?
	Wachstum	Streben Sie in den nächsten Jahren Unternehmenswachstum an? Wenn ja, in welcher Form und wieso?
	Weitere Kontakte	Kennen Sie andere Unternehmen, die sich für Nachhaltigkeit einsetzen und mit denen ich mich unterhalten sollte?
	Dank und weiteres Vorgehen	Interview wird transkribiert. Anfrage bei Zitaten. Forschungsprojekt dauert noch bis 2024
Postskriptum	Im Anschluss ans Interview	Bemerkungen und Beobachtungen zum Interview, der Interviewsituation etc.

Anhang: Wie transformativ ist Ihr Unternehmen? Eine Selbsteinschätzung (Blatt für Interviewführung)

Anmerkungen

- Mit diesem Fragebogen soll eruiert werden, wie transformativ sich die Unternehmen bzw. Unternehmer*innen einschätzen. Transformative Unternehmen sind (laut Literatur) sozial-ökologische pionierhafte kleine und mittelgrosse Unternehmen (KMU), die sich für einen grundlegenden Wandel in Richtung Nachhaltigkeit einsetzen.
- Der/Die Unternehmer*in wird gebeten, jede Einschätzung kurz zu begründen und 1-2 Beispiele zu nennen.
- Die Gesamteinschätzung ist nicht Teil des Interviews. Sie wird von mir einmal VOR und einmal NACH dem Interview ausgefüllt (um den «Ankereffekt» zu korrigieren).
- Der Interviewpartnerin / dem Interviewpartner wird ein vereinfachter Leitfaden vorgelegt.

Ökologische Nachhaltigkeit

Frage 1: Legt Ihr Unternehmen Wert auf Ressourceneffizienz / reduziert es seinen Ressourcenverbrauch? (A1.1.1 low resource use)

1	2	3	4	5	6
Nein, nicht besonders					Ja, sehr fest

Frage 2: Verringert das Unternehmen schädliche Umwelteinwirkungen und -Verschmutzung? (A1.1.2 low environmental pollution)

1	2	3	4	5	6
Nein, nicht besonders					Ja, sehr fest

Frage 3: Stellt das Unternehmen nachhaltige Produkte her oder erbringt es nachhaltige Serviceleistungen? (A1.1.3 sustainable products & services)

1	2	3	4	5	6
Nein, nicht besonders					Ja, ausschliesslich

Gesamteinschätzung: Engagiert sich das Unternehmen für **ökologische Ziele / Anliegen** (innerhalb/ausserhalb des Betriebes) (A1.1 small ecological footprint)?

1	2	3	4	5	6
Ökologische Anliegen spielen keine Rolle					Ökologische Anliegen sind zentral für unser Handeln

Wachstum

Frage 1: Beschränken Sie bewusst das Unternehmenswachstum? Weshalb (nicht)? (A2.2.1 limits to growth)

1	2	3	4	5	6
Nein, gar nicht					Ja, sehr stark

Frage 2: Sind Sie als Unternehmen abhängig von Unternehmenswachstum? Weshalb (nicht)? (A2.2.2 growth dependency)

1	2	3	4	5	6
Nein, gar nicht					Ja, in allen möglichen Bereichen

Frage 3: Wie wichtig ist Gewinn in Ihrem Unternehmen? (Welche Ziele sind Ihnen sonst noch wichtig?) (A2.2.3 raison d'être)

1	2	3	4	5	6
Total sekundär					Sehr wichtig

Gesamteinschätzung: Wie wichtig ist bei Ihnen Unternehmenswachstum und welches Wachstum steht dabei im Zentrum (oder auch nicht)? (A2.2 growth criticism)

1	2	3	4	5	6
Unternehmenswachstum ist das wichtigste Unternehmensziel					Wir verfolgen v.a. andere Ziele als Unternehmenswachstum

Produkte und Dienstleistungen

Frage 1: Hat die Qualität ihrer Produkte und Dienstleistungen einen hohen Stellenwert (vs. Quantität)? (A2.5.1 high quality products and services)

1	2	3	4	5	6
Nein, nicht besonders					Ja, sehr

Frage 2: Positioniert sich das Unternehmen in einem Nischenmarkt? (A2.5.2 niche markets)

1	2	3	4	5	6
Nein, gar nicht					Ja, ausschliesslich

Frage 3: Bieten Sie Dienstleistungen für Reparatur und Wiederverwertung an? Welche? (A2.5.3 service orientation)

1	2	3	4	5	6
Nein, gar keine					Ja, mehrere

Gesamteinschätzung: Verfolgen Sie eine Produkt- und Marktstrategie, die Nachhaltigkeit befördert und Ihr Unternehmen weniger abhängig von Wachstum macht (Nischenmärkte, Qualität statt Quantität, Reparatur usw.)? (A2.5 alternative products & services)

1	2	3	4	5	6
Mit unseren Produkten und Dienstleistungen sowie unserer Marktstrategie heben wir uns nicht besonders als nachhaltiges Unternehmen von den anderen ab.					Mit unseren Produkten und Dienstleistungen sowie unserer Marktstrategie heben wir uns als besonders nachhaltiges Unternehmen von den anderen ab.

Regionale Wirtschaft

Frage 1: Ist Ihr Unternehmen sehr nahe an seinen Kunden dran? Pflegen Sie direkte Kundenkontakte? (A2.8.1 customer proximity & -orientation)

1	2	3	4	5	6
Nein, nicht besonders					Ja, sehr

Frage 2: Pflegen Sie regen direkten Kontakt mit Zulieferern und anderen Stakeholdern? (A2.8.2 relational organizational identity)

1	2	3	4	5	6
Nein, nie					Ja, immer

Frage 3: Folgt Ihr Unternehmen dem Motto «aus der Region für die Region»? (A2.8.3 regionalization)

1	2	3	4	5	6
Nein, nicht besonders					Ja, ausschliesslich

Frage 4: Spielen gesellschaftliche oder regionale Bedürfnisse bei Ihren Innovationen eine Rolle? (A2.8.4 innovation)

1	2	3	4	5	6
Nein, gar keine					Ja, eine sehr grosse

Gesamteinschätzung: Ist Ihr Unternehmen stark in der Region verankert, in der es tätig ist (BeO, Mittelland, Berner Jura)? Bezeichnen Sie sich als regionales Unternehmen oder spielt der Raum keine Rolle? (A2.8 economic embeddedness)

1	2	3	4	5	6
Die Region ist für uns nicht wichtig.					Wir sind in der Region stark verankert
Wir haben keinen engen Austausch mit den Menschen und er Wirtschaft hier (Gemeinde/Region)					Wir haben einen sehr engen Austausch mit den Menschen und der Wirtschaft hier (Gemeinde / Region)

Werte

Frage 1: Ist Ihr Unternehmenshandeln durch ökologische und soziale Ziele & Werte motiviert? (Durch welche?) (A3.1.2 alternative goals; A3.1.1 social justice and solidarity)

1	2	3	4	5	6
Nein, gar nicht					Ja, ausschliesslich

Frage 2: Wie wichtig sind Umsatz- und Gewinnmaximierung als Messgrösse für Unternehmenserfolg? Warum (un)wichtig? (A3.1.2 alternative goals)

1	2	3	4	5	6
Gar nicht wichtig					Sehr wichtig

Frage 3: Erfasst Ihr Unternehmen (soziale, ökologische, wirtschaftliche) Folgen seines Handelns? (A3.1.3 impact awareness)

1	2	3	4	5	6
Nein, nie					Ja, immer

Frage 4: Wie sehr ist Ihnen als Unternehmer bewusst, welche Folgen das Handeln Ihres Unternehmens hat? (A3.1.3 impact awareness)

1	2	3	4	5	6
Nicht besonders					Sehr fest

Gesamteinschätzung: Ist Ihr Unternehmenshandeln primär durch ökologische oder soziale Ziele & Werte motiviert? Oder stehen ökonomische Ziele wie Umsatz und Gewinn im Vordergrund? (A3.1. value orientation)

1	2	3	4	5	6
Umsatz - und Gewinn sind die wichtigsten Messgrössen für Unternehmenserfolg					Umsatz und Gewinn sind unbedeutende Messgrössen für Unternehmenserfolg

Ideen nach aussen tragen

Frage 1: Ist der/die Unternehmer*in bzw. sind Sie als Unternehmer*in idealistisch? Inwiefern? (A3.2.1 idealist)

1	2	3	4	5	6
Nein, gar nicht					Ja, sehr

Frage 2: Ist der Geschäftsführer / die Geschäftsführerin ein Vorbild für andere? Inwiefern? (A3.2.2 role model)

1	2	3	4	5	6
Nein, gar nicht					Ja, sehr ausgeprägt

Frage 3.1: Engagiert sich Ihr Unternehmen für Veränderungen in der Branche (z.B. in Verbänden, mit Infoveranstaltungen, Austauschplattformen, Netzwerken etc.)? (A3.2.3 public outreach)

1	2	3	4	5	6
Nein, gar nicht					Ja, sehr fest

Frage 3.2: Können Sie mit Ihrem Engagement Veränderungsprozesse in der Branche auslösen? (A3.2.3 public outreach)

1	2	3	4	5	6
Nein, gar keine					Ja, sehr viele

Gesamteinschätzung: Kann Ihr Unternehmen andere durch sein Handeln inspirieren (Best Practices) oder vielleicht sogar in der Branche Veränderungsprozesse auslösen? Wie? (A3.2 sense of mission)

1	2	3	4	5	6
Unser Unternehmen hat nicht den Anspruch oder das Potential, Veränderungen in der Branche Richtung Nachhaltigkeit auszulösen					Unser Unternehmen hat den Anspruch oder das Potential Veränderungen in der Branche Richtung Nachhaltigkeit auszulösen.

Anderes

Engagieren Sie sich mit Ihrem Unternehmen für andere Dinge, mit denen es sich von anderen abhebt (andere Dinge, die Sie als transformativ erachten)?
Wofür?

11.3 Interview guides for expert interviews (article III)

Interviewleitfaden

Gespräch mit:
Unternehmen oder Organisation:
Datum:
Form (online / vor Ort):

Teil	Thema	Inhalt und Fragen	Notizen
Einführung und Vorstellung ca. 5’	Begrüssung	Name, Universität, Forschungsgruppe Interview in drei Teilen	
	Datenschutz	Einverstanden mit Aufnahme des Gesprächs (als Gedankenstütze)? Aufnahme starten Bei Annahmen noch einmal mit eingeschalteter Aufnahme: Dann sind Sie also einverstanden, dass das Interview aufgenommen wird. Die Aufnahme wird nur von mir und ausgewählten Mitarbeitenden des Forschungsprojektes verwendet und auf dem Server der Uni Bern gespeichert, auf den nur Mitarbeitende des Forschungsprojektes Zugriff haben. Die Daten können für Publikationszwecke verwendet werden. Für Publikationen werden Sie nicht namentlich genannt (Pseudonymisierung).	
	Zum Projekt (auf Nachfrage)	In meiner Forschung untersuche ich, welche Rolle Unternehmen in einer nachhaltigeren Zukunft spielen können. Gegenwärtig mache ich eine vergleichende Fallstudie der Holzbranche im Kanton Bern (CH) und im Bundesland Vorarlberg (AUT). Ich analysiere, inwiefern der industrielle Kontext besonders nachhaltige Unternehmen fördert oder in ihrem Wirken einschränkt.	
	Vorstellung Interviewpartner*in	Können Sie sich kurz vorstellen? Wie sind Sie persönlich zur holzverarbeitenden Industrie gekommen?	
TEIL 1	Einführung	Als erstes möchte ich nun kurz auf die Entwicklung des regionalen Holzsektors hinsichtlich Nachhaltigkeit eingehen.	

Entwicklung des Holzsektors ca. 5-10’	(Schlüsselereignisse)	Welche Schlüsselereignisse der letzten 10-30 Jahre hatten einen Einfluss auf den Holzsektor / die holzverarbeitende Industrie?
	Entwicklung	Welche Entwicklungen hinsichtlich Nachhaltigkeit konnten Sie in der Berner / Vorarlberger holzverarbeitenden Industrie / im Holzsektor in den letzten Jahren beobachten? Ökologische NH Ökonomische NH Soziale NH
	Heutige Situation	Wie schätzen Sie die heutige Situation der Industrie mit Blick auf Nachhaltigkeit ein?
TEIL II Nachhaltigkeit: Herausforderungen & Chancen, ca. 10-15’	Einführung	Im zweiten Teil geht es um Herausforderungen und Chancen der Industrie mit Blick auf eine nachhaltige Entwicklung in der Region. Wir beginnen gleich mit der Dimension Ökologie…
	Ökologie	Auf welche Herausforderungen und Chancen trifft die regionale Industrie aus Ihrer Sicht im Bereich Ökologie? CO2-Speicher, Klimawandel Transporte, etc.
	Technologie	Wo sehen Sie im Bereich Technologie Herausforderungen und Chancen für die regionale holzverarbeitende Industrie? Verleimte und neue holzbasierte Materialien Kreislaufwirtschaft, etc.
	Wirtschaft	Wie schätzen Sie wirtschaftliche Herausforderungen und Chancen der regionalen Industrie hinsichtlich Nachhaltigkeit ein? Zusammenarbeit in WSK Wettbewerbsfähigkeit Regionalisierung vs. Globalisierung, etc.
	Institutionen	Auf welche erschwerenden oder förderlichen institutionellen Rahmenbedingungen im Hinblick auf Nachhaltigkeit trifft die Industrie? Ebenen: Kanton/Land, national, EU Gesetze und Vorschriften; Organisationen
	Kultur	Inwiefern spielen kulturelle Trends in Bezug auf Nachhaltigkeit eine Rolle? Trend zu Nachhaltigkeit vs. nicht nachhaltige Strukturen / Verhalten Holz als Kulturgut, Handwerk etc.
TEIL III	Einführung	Im dritten Teil gehe ich darauf ein, inwiefern die Industrie besonders nachhaltige Unternehmen fördert oder in ihrem Wirken

Bedingungen für transformative Unternehmen, ca. 20’		einschränkt. Wir haben besonders nachhaltige Unternehmen mit neun Schlüsseldimensionen beschrieben. Ich werde nun zu jeder der Dimensionen Fragen stellen.
	Mission	Inwiefern kann man in der Branche als Unternehmer*in eine ökologische oder soziale Mission verfolgen?
	Stabilität & Autonomie	Inwiefern stehen Unternehmen unter Druck zu wachsen und zu investieren?
	Ökologischer Fussabdruck	Inwiefern haben Unternehmen einen Anreiz, ihren ökologischen Fussabdruck zu minimieren? (Zielkonflikte?)
	Soz. Verantwortung	Inwiefern haben Unternehmen einen Anreiz, sich für soziale Anliegen einzusetzen?
	Partizipative Governance	Inwiefern beobachten Sie in der Branche Tendenzen zu alternativen Führungsmodellen (z.B. flache Hierarchien) und Eigentumsstrukturen?
	Alternative Produkte & Services	Wie verbreitet experimentieren Unternehmen mit alternativen Produkten und Dienstleistungen? Mit welchen? Kennen sie konkrete Beispiele?
	People before profit	Welche Rolle spielt der Shareholder-Value/Unternehmenswert für Unternehmen der Branche? Inwiefern sind Dumpingpreise und -Löhne in der Branche ein Thema? Wie schätzen Sie die Lohngerechtigkeit in der Branche ein?
	Regionalisierung	Inwiefern sind holzverarbeitende Unternehmen regional verankert? Rohstoff(e) Mitarbeitende, Zulieferer usw. Inwiefern spüren diese Unternehmen Druck zu internationalisieren?
	Change agent	Wo sehen Sie für Unternehmen Handlungsspielräume, um Veränderungen anzustossen? Welche Beispiele von Nachhaltigkeitspionieren unter holzverarbeitenden Unternehmen fallen Ihnen ein?
Schluss ca. 5’	Weitere Interviewpatner*innen und DANK	Schlüsselunternehmen Verbände Forschung Holzingenieurbüros Innovationsförderung, Clusterorganisationen Regionalentwicklung; weitere Schlüsselakteure

Factsheet
November 2023

Transformative Unternehmen

Fallbeispiel holzverarbeitende Industrie Kanton Bern

Forschungsprojekt der Unit Wirtschaftsgeographie, Geographisches Institut der Universität Bern, mitfinanziert von der Wyss Academy for Nature

Bild: Miriam Hug

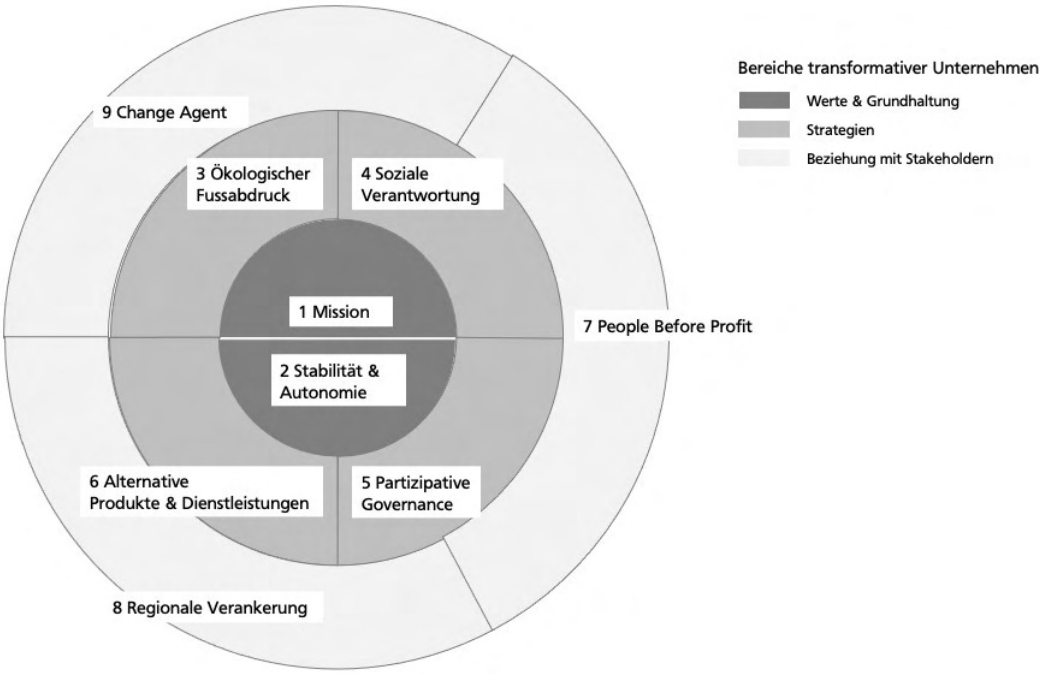
Thema und Forschungsfrage. Auf dem Weg zu einer nachhaltigen Wirtschaft sind Unternehmen Schlüsselakteure. Dieses Forschungsprojekt analysiert, welche Rolle sogenannte „transformative Unternehmen" in der Nachhaltigkeitstransformation spielen können. Fallbeispiel ist die holzverarbeitende Industrie des Kantons Bern, welche einerseits mit wirtschaftlichen und ökologischen Herausforderungen kämpft, andererseits auch grosses Potenzial hinsichtlich Nachhaltigkeit hat.

Methodisches Vorgehen. In einer ersten Phase sichteten wir die wissenschaftliche Literatur zu transformativen Unternehmen und erarbeiteten eine **Definition**. Um der Frage nachzugehen, ob es in der holzverarbeitenden Industrie transformative Unternehmen gibt, führten wir in einem zweiten Schritt **24 Unternehmensinterviews**. Die Auswahl der Interviewpartner:innen erfolgte basierend auf einem **Firmeninventar**, in dem wir Informationen zu 86 möglicherweise transformativen und pionierhaften Unternehmen in der Branche zusammenstellten. Wir analysierten die 24 Interviews und bildeten **Unternehmenstypen**, welche in unterschiedlichem Ausmass Eigenschaften transformativer Unternehmen besitzen. Empfehlungen zur Förderung transformativer Unternehmen erarbeiten wir demnächst.

Was sind transformative Unternehmen? Transformative Unternehmen sind Unternehmen, welche zu einem grundlegenden Wandel in Richtung Nachhaltigkeit beitragen. Im ersten Schritt der Forschungsarbeit haben wir **neun Schlüsseldimensionen** eines idealtypischen transformativen Unternehmens definiert. Transformative Unternehmen...

1. ... sind motiviert durch eine starke **Mission**.
2. ... streben **Stabilität & Autonomie** an.
3. ... reduzieren den **ökologischen Fussabdruck.**
4. ... übernehmen **soziale Verantwortung.**
5. ... experimentieren mit **partizipativen Governance-Strukturen.**
6. ... bieten **alternative Produkte und Dienstleistungen** an.
7. ... handeln nach dem Motto **People before Profit** (Mensch vor Profit).
8. ... haben eine starke **regionale Verankerung.**
9. ... engagieren sich als **Change Agents** (Agenten des Wandels).

Neun Schlüsseldimensionen transformativer Unternehmen



Referenz
Hug, M., Mayer, H., & Seidl, I. (2022). Transformative enterprises: Characteristics and a definition. *Geography Compass*. https://doi.org/10.1111/gec3.12667

Gibt es transformative Unternehmen in der Holzbranche? Dieser Frage gehen wir momentan nach. Basierend auf den Unternehmensinterviews im Kanton Bern haben wir **fünf Unternehmenstypen** identifiziert, von denen vier das Potenzial haben, transformativ zu wirken.

Silent Ecologist (stille Ökolog:innen)

- Kleine, regional verankerte Unternehmen, bedienen vor allem Nischenmärkte
- Verarbeiten regionale Rohstoffe
- Sind „schon lange ökologisch", heben dies nicht hervor

Social Pioneer (soziale Pionier:innen)

- Eher kleine Unternehmen; nicht nur für Nischenmärkte
- Unternehmer*innen setzen sich für Integration ein (Erwerbslose, IV usw.)

Visionary Nonconformist (visionäre Nonkonformist:innen)

- Eher kleine Unternehmen; bedienen Nischenmärkte
- Von Mission getrieben, möchten „Dinge anders machen" (Wertewandel, z.B. flexible Arbeitszeitmodelle, Null-Wachstumsstrategie usw.)

Ambitious Entrepreneur (ambitionierte Unternehmer:innen)

- Grössere Unternehmen; bedienen v.a. Nischenmärkte
- Technologisch innovativ
- Gut vernetzt, auch ausserhalb der Branche

Pragmatist Traditionalist (pragmatische Traditionalist:innen)

- Grössere Unternehmen; bedienen Mainstream-Markt
- Traditionelle Produkte und Dienstleistungen

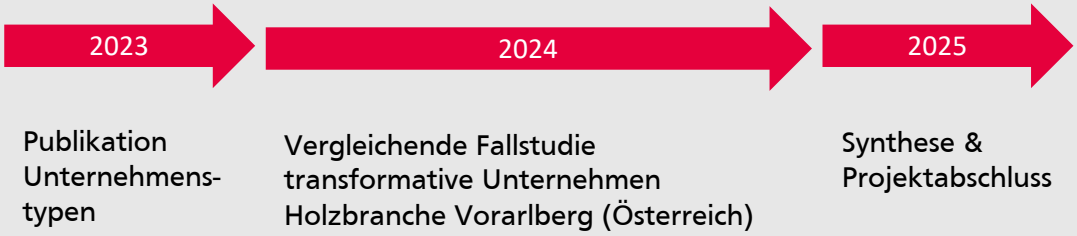
Die vier ersten Unternehmenstypen besitzen viele transformative Eigenschaften. Sie haben z.B. eine starke Mission, experimentieren mit alternativen Produkten und Dienstleistungen oder reduzieren den ökologischen Fussabdruck des Unternehmens (Schlüsseldimensionen rot markiert in Graphiken). Den Typ der pragmatischen Traditionalist:innen schätzen wir als weniger transformativ ein, da seine Eigenschaften (soziale Orientierung und regionale Verankerung) in der ganzen Branche vertreten sind.

Take Home Messages

- Für die Nachhaltigkeitstransformation spielen Unternehmen eine zentrale Rolle.
- Die holzverarbeitende Industrie ist schon relativ „grün" und „sozial". Mit dem Werkstoff Holz hat sie das Potenzial, nachhaltige Entwicklung voranzutreiben.
- In der holzverarbeitenden Industrie gibt es Unternehmen mit transformativen Eigenschaften.
- Unternehmen mit transformativen Eigenschaften können derzeit aber noch wenige Veränderungen ausserhalb der Firma bewirken, weil der ökonomische Kontext ungünstig ist und Unternehmen begrenzte Kapazitäten für ausserbetriebliches Engagement haben.
- Um günstige Rahmenbedingungen für transformative Unternehmen zu schaffen, sind spezifische Fördermassnahmen nötig (Empfehlungen werden von uns derzeit erarbeitet).

Projektlaufzeit. 01/2020 bis 06/2025

Nächste Schritte.



Outputs.

2022. Präsentation des Forschungsstandes anlässlich der Global Conference on Economic Geography in Dublin (online).

2022. Publikation zur Definition transformativer Unternehmen in der Fachzeitschrift *Geography Compass:* Hug, M., Mayer, H., & Seidl, I. (2022). Transformative enterprises: Characteristics and a definition. *Geography Compass*. https://doi.org/10.1111/gec3.12667.

2023. Veröffentlichung eines Kurzvideos zum Projektstand, welches im Rahmen des Berner Holztages gezeigt wurde.

2023. Präsentation des Forschungsstandes anlässlich des Deutschen Kongresses der Geographie in Frankfurt.

Projekt im Web

Universität Bern

Lignum Holzwirtschaft Bern

Kurzvideo zum Projekt

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