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Challenge-oriented regional innovation systems (CORIS): sustainability transformations 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 revolutionise 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 systems (CORISs) 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.

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1. Introduction

Mountain regions, which dominate large parts of Austria and Switzerland, need to find innovative solutions to regional transformation and sustainability. In the timber sector, which is an important natural resource-based industry in these regions, this challenge manifests as the necessity to boost regional value creation and to promote timber construction practices. Although the timber sector is not known for being particularly innovative or transformative (Nilsen et al., 2024) 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 revolutionise 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 regional development (Gauzin-Müller, 2020).

In Vorarlberg, challenge-oriented initiatives geared towards regional value creation and the promotion of timber construction practices led to the formation of a so-called challenge-oriented regional innovation system (CORIS) (Tödtling et al., 2022) around the timber sector. In this paper, we study regional innovation system (RIS) reconfiguration, i.e., how regional innovation systems integrate sustainability challenges, by contrasting the Vorarlberg case with the case of Bern (Switzerland). Compared to Vorarlberg, the timber sector in Bern could be labelled a latecomer because challenge-oriented initiatives are only emerging. In times of polycrisis, where regional economies are struggling to adapt to economic distortions, social unrest, and climate heating (e.g., Rodríguez-Pose, 2018), it is essential to understand the processes of sustainability transformation. The comparison of our two cases is informative because they represent different stages of

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RIS reconfiguration. Exploring RIS reconfiguration in the Vorarlberg and Bernese timber sectors can advance our knowledge of systemic aspects and innovation dynamics in transformation processes and inform academics and policy makers alike.

The notion of CORIS resulted from a recent revision of the RIS concept (Asheim et al., 2019, p. 13). In 2021, Tödtling et al. (2022) 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. At the regional level, these challenges may manifest as the need to promote climate mitigation or to strengthen regional economies. The CORIS approach goes beyond the technocentric view which so far dominated RIS studies and emphasises place-based problems and needs. Additionally, it addresses RIS reconfiguration, that is, changes in RIS aiming at the integration of sustainability challenges (Trippl, Fastenrath, et al., 2024). 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, Baumgartinger-Seiringer, et al., 2024). CORIS moreover acknowledges the importance of system-level agency which may change the RIS structure and hence contribute to RIS reconfiguration (Trippl, Baumgartinger-Seiringer, et al., 2024).

Even though the CORIS concept has recently been applied in empirical studies – for example on e-mobility in Vorarlberg (Tödtling et al., 2022), 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, Baumgartinger-Seiringer, et al., 2024, pp. 6–7). Accordingly, the question who performs change agency – be it firms, cluster organisations, policy makers, universities, civil society actors or others – often remains unanswered (Trippl, Baumgartinger-Seiringer, et al., 2024, pp. 6–7). To understand the role of system-level change agency in RIS reconfiguration and to address the question who performs change agency in this process, systematic comparative studies of different CORISs could be insightful (Trippl, Baumgartinger-Seiringer, et al., 2024, p. 5). Such studies are, however, still missing. More generally, there is a lack of knowledge on how regions change their RISs in response to grand societal challenges (Tödtling et al., 2022, p. 15). Strategies of peripheral and mountain regions are of particular interest here (Trippl, Baumgartinger-Seiringer, et al., 2024, p. 5), as these types of regions often face innovation barriers such as organisational 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., Blair et al., 2017; Jolly et al., 2020; Martin et al., 2023), 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, organisations 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 Section 2, we describe the CORIS approach more closely. Then, in Section 3, follows the outline of the qualitative comparative case study design. Section 4 characterises the two case study regions. Subsequently, RIS elements enhancing challenge orientation in Vorarlberg and Bern are described and system-level change agency is examined (Section 5). Section 6 discusses the results and concludes.

2. Theoretical approach

The concept of challenge-oriented regional innovation systems (CORIS) (Tödtling et al., 2022) is useful for our study of RIS adaptation to the challenges of regional value creation and promoting timber construction practices. CORIS is a recent adaptation of the concept of regional innovation systems (RIS) that aims at addressing grand challenges in regions and is inspired by recent work on mission-oriented, challenge-oriented and transformative innovation policies (Tödtling et al., 2022, p. 2).

CORIS analyses three key elements, 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 elements we considered, illustrates that actors, networks and institutions can be situated in all three subsystems of a CORIS, the production subsystem, the knowledge generation and diffusion subsystem, and the policy subsystem. Figure 1 also shows that CORIS 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 CORIS (Asheim et al., 2019, pp. 2–3).

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 recognised as playing a key role in the development, application and scaling of innovative solutions for territorial challenges (Trippl, 2023; Trippl, Fastenrath, et al., 2024). 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, Baumgartinger-Seiringer, et al., 2024). This paper aims at identifying innovation actors, networks and institutions in a CORIS but does not focus on innovation types and processes.

The CORIS concept triggered interest in the reconfiguration processes RISs undergo to enhance their challenge orientation (Trippl, Fastenrath, et al., 2024, p. 4f.). Two ideal-typical routes of RIS reconfiguration are identified: reorientation and transformation (Isaksen et al., 2022). While the reorientation route mobilises assets, actors, networks and institutional structures of existing RISs to pursue new goals, the transformation

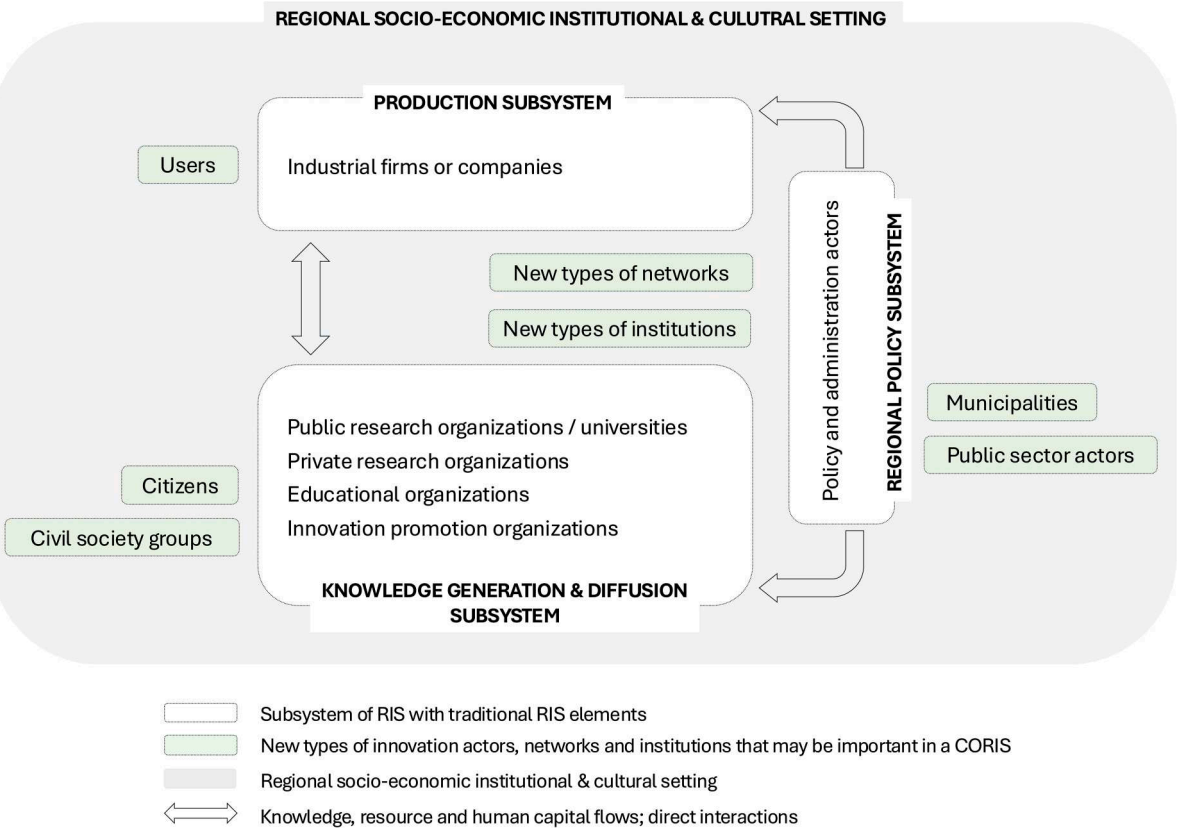

Figure 1. The structure of a CORIS, incl. the elements considered in this study (modification of Tödtling & Trippl, 2005, p. 1206).

Table 1. Differences between RIS and CORIS.

	Traditional RIS	Challenge-oriented RIS (CORIS)
Type of *actors* considered	Traditional 'triple helix' actors: • Firms, trad. economic actors • Research and 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

Source: Authors' own compilation based on Isaksen et al. (2022) and Tödtling et al. (2022).

route is characterised 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, Fastenrath, et al., 2024, p. 5). Table 1 summarises the CORIS approach.

To date, RIS change is little researched (Steinböck & Trippl, 2023, p. 736), except for Trippl, Fastenrath, et al. (2024) 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 *second* category, the investigation of four core processes allows the understanding of 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-destabilisation* (are there old unsustainable paths and RIS structures which are destabilised? 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 the assessment of whether a CORIS emerged or old unsustainable paths were continued (Trippl, Fastenrath, et al., 2024, pp. 5–8).

The model of RIS reconfiguration can guide empirical analysis. We therefore used it in our study (see Section 3, Figure 2), adding an explicit focus on system-level agency which may be an additional step in

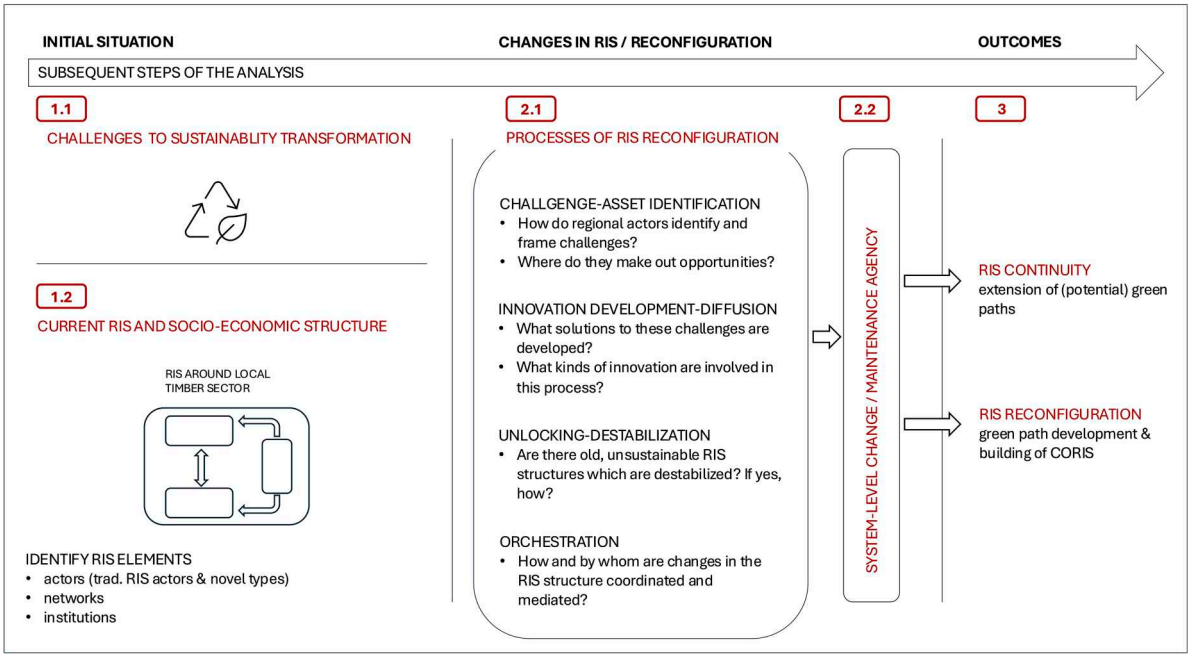

Figure 2. Overview of analytical steps undertaken (own presentation based on Trippl, Fastenrath, et al., 2024, p. 6).

explaining changes in RISs (Trippl, Baumgartinger-Seiringer, et al., 2024, pp. 6–7): Actors can exert system-level agency and become change agents through activities like creating new system elements (e.g., a research centre), collective vision building, networking, resource mobilisation, institutional adaptation, legitimation of change, or policy design and implementation (Trippl, Baumgartinger-Seiringer, et al., 2024). 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., Section 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, Fastenrath, et al., 2024) 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 analysed, 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).

Document analysis and expert interviews fed into all analytical steps. The analysis in steps 1.1 and 2.1 was predominantly based on interviews because few documents were available and not regionally specific. Meanwhile, steps 1.2 and 2.2 mostly drew on document analysis because available documents revealed to be sufficiently informative. For the document analysis, we studied academic and grey literature on the timber sector and analysed 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 recruit 11 interview partners in the Vorarlberg region and 13 in Bern. Eleven 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). Through deductive coding, we assigned text to predefined categories that were based on the research questions (e.g., challenges to sustainability transformation, RIS actors and change agents, framework conditions supporting or hindering change). Inductive coding served to build new categories that emerged from the transcript, for example, on the organisation of the sector or other background and insider information. Preliminary results were discussed and validated during a three-day study trip to Vorarlberg, which the first author of this paper attended alongside experts of the industry association *Lignum Bern.* Moreover, pending questions and data interpretation were discussed among co-authors.

4. Case study regions: situation and challenges

Our case study regions are located in Austria and in Switzerland, two neighbouring countries in Central Europe. We compare the 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 and 1.2 in Figure 2).

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

Table 2. Overview of interview partners.

No.	RIS actor	Organisation 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		1 h 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	1 h 15min
12		Timber engineering firm	BE		1h
13		Timber engineering firm	VA		45min
14		Architectural office	VA		40min
7*	Innovation promotion, cluster organisations	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	Enterprise	BE	X	45min
18	(1–9 employees)	Enterprise	VA	X	45min
19	Small enterprises	Enterprise	VA	X	1h
20	(10–49 employees)	Enterprise	BE	X	50min
21		Enterprise	VA	X	1h
22		Enterprise	VA		30min
23	Medium-sized enterprises (50–249 employees)	Enterprise	BE		1 h 5min
24	Large enterprises (>250 employees)	Enterprise	VA	X	55min

Note: * indicates persons covering more than one RIS actor role.

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

(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, industrialised 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 technologised 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.

According to our interviews, the challenges the timber sector faces are similar in Vorarlberg and Bern. In the following, we report on two challenges that are particularly pronounced in both regions, and that also emerged from our document analysis: regional value creation and the promotion of timber construction, including circular economy practices. The first challenge is regional value creation which is under pressure. Especially wood harvesting and sawing cause concern: wood harvesting yields little money as the examined regions have strict forest laws, small-scale ownership structures in forests and topographical challenges. At the same time, harvesting and reforestation would be needed to adapt forests to the hotter climate (I-14, VA[4]). Regarding sawing, competition by large players is pronounced: Particularly in Bern the industry is struggling and has seen intense restructuring with firm closures and concentration dynamics over the past decades (I-1, BE; I-17, VA). Moreover, the value chain in both regions is lacking a producer of laminated wood used in modern timber architecture. As interviewees noted, it would, however, be difficult to set up a new production plant because land is scarce in the densely populated regions (I-13, VA). Firm closures and incomplete regional value chains imply that the volume and length of timber transports increases and that local job opportunities may get lost. Regional value creation is also hampered by the need to remain economically competitive. Competition has increased cost and time pressures – especially in the smaller small- and medium-sized enterprises (SMEs) who compete with large players (I-13 and I-17, VA). Swiss SMEs additionally lament unfair conditions because of strict regulations in Switzerland and subsidies (for energy or land) in neighbouring countries. Cost pressures moreover inhibit the use of ecological products in timber construction which are usually more expensive (I-11 and I-12, VA).

The second challenge is the promotion of timber construction and implementation of circular economy practices.[5] Promoting timber construction is difficult for three reasons. First, timber has long had a bad reputation as a building material: In many people's minds, timber is neither fire- nor waterproof. Moreover, timber has been used for building barracks and cheap housing after WWII (I-1, BE; I-23, VA). With the emergence of modern timber buildings that do not resemble a barrack or a *Chalet*, the reputation of timber has, however, improved (this has happened in Vorarlberg significantly earlier than in Bern). Second, the timber sector is confronted with a strong lobby for cement which now also promotes 'green' or 'recycled' cement (I-1, BE) (which is also more pronounced in Bern than in Vorarlberg). And third, the general population is increasingly critical about wood harvesting (I-19, BE) which complicates regional wood provisioning.

If timber is used for construction, the implementation of various circular economy practices, namely rethinking, reuse, remanufacturing, repurposing and recycling (five of the nine dimensions of the R-ladder by Potting et al. (2017)) pose challenges: Many wood products are not yet reusable in the sense of a circular economy due to composites like plastic and glue, but also metallic parts like screws or cement (I-14, BE; I-12, VA). New products and building systems would need to be developed. This is, however, hampered by the facts that so far circular uses of the resource wood are unprofitable, amongst others because wood recycling is expensive, and burning wood for energy production lucrative (I-19, BE). The drive to develop new products remains low, because generally, climate change is not much of a topic in the construction industry (I-22, VA).

Table 3 compares the two regions and highlights major challenges. We illustrate the different conditions these regions face, which is important for the in-depth comparison of RIS reconfiguration that we present in the following section.

Table 3. Characterisation 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 organisation	• Democratic, federalist • Dominating parties: conservatives (SVP) • Political centrality: The Canton of Bern harbours 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: Over-aging 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	3500 (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 industrialisation after WWII • SMEs (1–149 employees) dominate; mainly micro-enterprises (1–9 employees)	• 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. • 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. • Wood processing contributes 4.5% to Vorarlberg's industrial production (2021)
	Challenges	• 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 and producer of particle boards).	• *Sawing is profitable*. The five largest sawmills are processing approx. 75% of the harvested timber. These sawmills moreover process wood from the neighbouring 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.).

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 and Weber (2022), Pauli-Krafft et al. (2021), Regionalentwicklung Vorarlberg eGen & Telesis GmbH (2018), Rücker et al. (2018), statista (2024).

Notes: * 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 and 3 in Figure 2). We first dive into the micro-level of RIS

reconfiguration processes and illuminate who exerted system-level change agency (Section 5.1). Then, we zoom out to the larger system and identify RIS elements that enhanced challenge orientation (Section 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.

Roughly 60 years ago, change agents, who were a group of young architects who called themselves *Baukünstler* (building artists), started exerting system-level change agency in the Vorarlberg timber sector. 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 authorised 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 realise 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 commercialisation, attentive to ecological concerns and propagated affordable housing through simple, collaborative and resource-saving architecture (Kapfinger, 2003, p. 9; Dangel, 2009, p. 275). Initially, the public criticised 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 fuelled 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 (Gauzin-Müller, 2011, p. 14; Kapfinger, 2003, p. 16). What had been a social movement thus became an institutionalised field.

The institutionalisation of the *Baukünstler* movement 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 a lawyer and employee of the chamber of commerce who presided over the association until the year 2024. Despite being an outsider 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 organises 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, organises exhibitions, competitions and lectures and is engaged in recruiting young talent (Werkraum Bregenzerwald, 2024).

During the 2000s, when Vorarlberg had long been a known destination for architectural tourists, timber architecture was further favoured by the institutionalisation 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 fulfil the ecological criteria[6] 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 programme energy future *(Energiezukunft Vorarlberg)* which was launched in 2007 and sets the goal of energy autonomy by 2050 (Gauzin-Müller, 2020, p. 154), and Vorarlberg has today become a showcase for sustainable development at the regional level (Gauzin-Müller, 2020, 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 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 nineteenth century (Sauter, 2024, p. 135), it is only in recent decades that non-traditional (modern) timber architecture has become established (Sauter, 2024, p. 133). While timber had been an important building material during the war period when other raw materials were unavailable (Adam, 2023, p. 155), the proportion of timber in Swiss buildings declined rapidly in the second half of the twentieth 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 (Sauter, 2024, p. 136).

It took until the late 1980s and 1990s before the new developments of modern timber architecture in the neighbouring country, Austria, swept into Switzerland. This was epitomised by the reintroduction of the national competition for timber architecture called *Prix Lignum* in 1999 which is now held 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 realisation of pioneering multistorey 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 organisation 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 organisations 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 programmes, 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 change. 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 identified individuals, institutions and policy actors exerting system-level change agency. In our case studies, individual change agents were key drivers of system-level change agency. They initiated change processes and created momentum which then led institutional actors and policy representatives to start developing system-level change agency too. 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 founder 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 found that the individual change agents and institutional support for RIS reconfiguration we observed must be viewed against the historic time as well as the regional socio-economic institutional and cultural context in which they are embedded: The role of individual change agents, institutional support structures and the socio-cultural context are intertwined. Looking at the example of Vorarlberg, we have seen that the *Baukünstler* movement emerged in the 1960s. Thinking and doing architecture differently was also a consequence of this historic time of upheaval. The fact that Vorarlberg is a small province in the far west of Austria moreover meant that members of the *Baukünstler* movement had to study outside the province, thereby establishing extra-regional connections. And finally, building up institutional and policy support for RIS reconfiguration in the Vorarlberg timber sector may have been easier in this small province where, according to our interviewees, everyone knows everyone.

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 (e.g., change agents like the *Baukünstler,* networks like *Vorarlberger Holzbaukunst* or new institutions like the Ecopass). 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.

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. Next to innovative firms, 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,

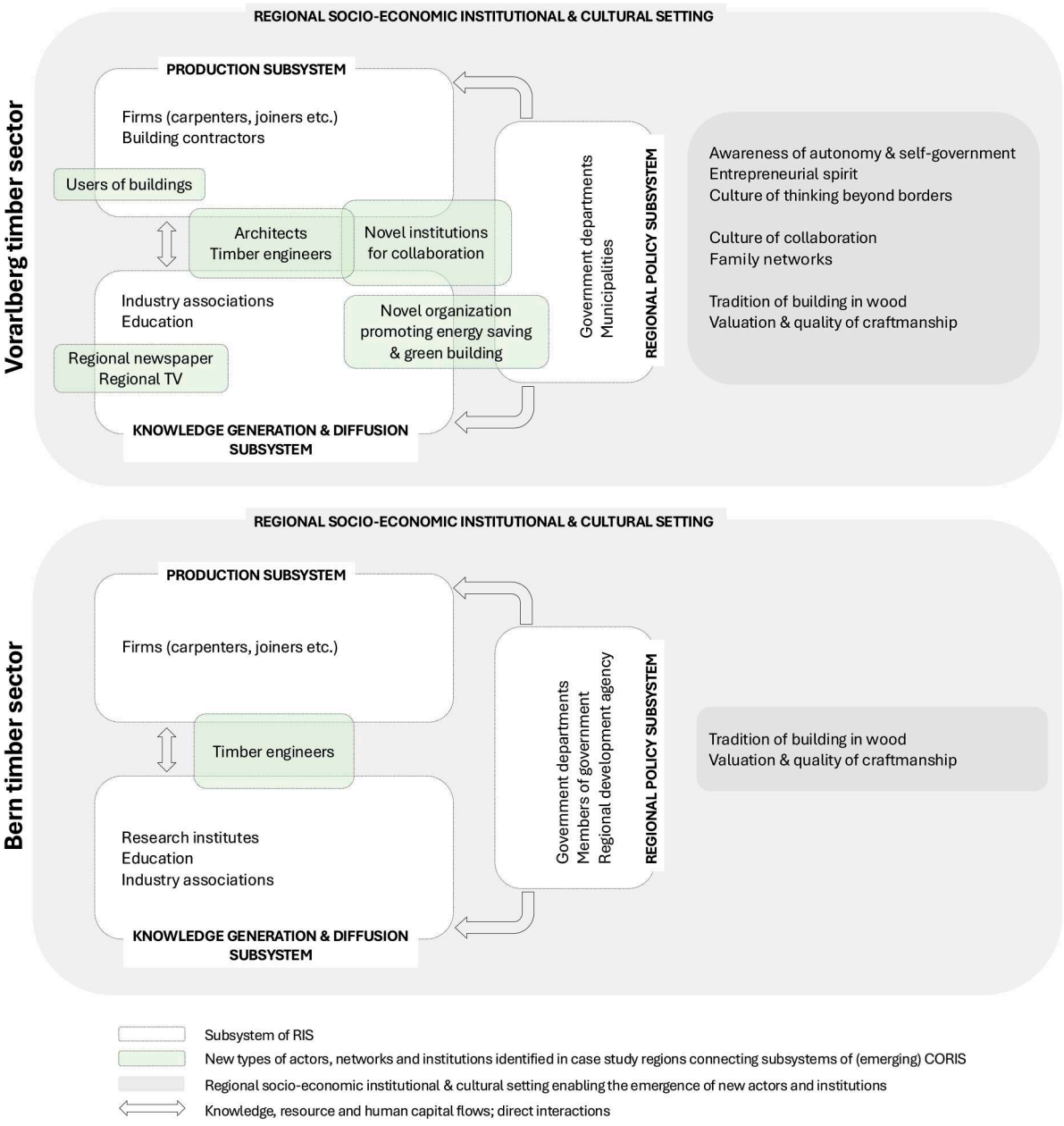

Figure 4. Comparison of RIS elements enhancing challenge orientation in case study regions.

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 the 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

Table 4. Identified RIS elements enhancing challenge orientation in the two study regions.

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 and 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 and 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 institutionalised 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)

Source: Authors' own compilation based on Tödtling et al. (2022, pp. 6–7).

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).

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 the 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 favourable 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 and conceptual 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. In particular, we presented rich empirical detail on how regional sustainability transitions take place in two different contexts during times of polycrisis. Besides, the analytical framework we applied adds a focus on system-level agency in such a context.

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. (2022) 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 centre (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 for experiments are needed for RIS reconfiguration. These findings are in line with Grillitsch et al. (2025) who stress the importance of resourceful individuals who can draw on their experiences, skills and networks (p. 14) to drive change. We recognise that the specific histories of RIS reconfiguration we described cannot be duplicated, but the CORIS concept is useful for identifying its components. *Finally,* our study contributes conceptually to the CORIS literature by investigating the link between system-level agency and RIS reconfiguration, which has so far been poorly understood (Trippl, Baumgartinger-Seiringer, et al., 2024, pp. 6–7). Our systematic and comparative analysis of the historical developments in the timber sectors of Vorarlberg and Bern reveals that a focus on system-level agency and the question who performs it is crucial for understanding RIS reconfiguration.

Our paper also opens new questions. The types of innovation leading to the formation of new networks and institutions in a CORIS should be investigated in the future. 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, p. 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., 2022, 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.

To conclude, we would like to suggest implications for regional development policy and stakeholders from the timber sector. As regards regional development policy, our study supports the recommendation to make sustainability transformation and challenge orientation a key focus (Mayer et al., 2021). Along with this, innovation must be understood more broadly (e.g., including social and other forms of innovation) and experimental approaches to regional development should be made possible (Mayer et al., 2021). More concretely, anchoring sustainability in regional development policy could involve strengthening local economies and regional value chains (Mayer et al., 2021). Our research also holds suggestions for stakeholders from the timber sector. *First*, creating and improving networks among actors along the entire value chain is key. *Second,* marketing and lobbying should not only convince large developers and architects to build in wood, but also sensitise the general population to the issue of timber (construction) and building culture. *Finally,* the use of regional resources and regional value creation should be a priority in the timber sector because various benefits flow back to it.

Notes

1. Social innovations are new forms of collaborations at the individual or organisational 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 and Van de Ven (2006) moreover emphasise 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).
4. I-XY = interviewee no. XY; VA = interviewee from Vorarlberg; BE = interviewee from Bern
5. 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 feasible 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). Hence the term cascadic use is also frequently used in the timber sector. Cascadic use means that the entire biomass of trees is processed 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 utilisation of residual wood assortments in the fibre materials industry) (Hassel et al., 2024, p. 229).
6. 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)

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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.

Disclosure statement

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Data availability statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

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