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Transforming provisioning systems to enable 1.5° lifestyles in Europe? Expert and stakeholder views on overcoming structural barriers

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ABSTRACT

This article explores the urgent need for transformative change toward provisioning systems that align with staying as close as possible to the Paris Agreement's 1.5 °C limit for climate change. Despite historical awareness of the need for change, current unsustainable patterns of production and consumption persist, prompting an examination of the role of societal structures in hindering transformative change. Using the framework of provisioning systems, this study analyses expert and stakeholder views on structural barriers and steps to overcome them. Based on 36 expert interviews and Stakeholder Thinking Labs with 113 participants in five European Union case countries, the study identifies and discusses seven key structural barriers that affect the sustainability of provisioning systems for food, mobility, housing, and leisure. These barriers include the economic growth paradigm, policy incoherence, vested interests, the externalization of environmental costs, dominant narratives of the good life, inequality, and an insufficient integration of environmental concerns in educational systems. When considering the actualization of these structures in concrete provisioning systems, stakeholders emphasize the need for welfare provision with improved resource efficiency; argue for radical measures such as bans, limits, and taxes to address these challenges; and highlight governance challenges related to participation and power. The analysis underlines the complexity of promoting transformative structural change and the interplay of structures in different provisioning systems, emphasizing the need for a holistic approach to achieve sustainable provisioning systems and 1.5° lifestyles.

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Provisioning systems; sustainability; structures; transformation; consumption; lifestyles

Introduction

The Sixth Assessment Report (6AR) of the Intergovernmental Panel on Climate Change (IPCC) (IPCC 2022) underlined that delivering on the Paris Agreement and the 1.5 °C limit (as well as other human-induced environmental crises such as biodiversity loss at the scale of mass extinction) requires a radical and immediate social-ecological transformation toward new, 1.5 °C-aligned forms of provisioning (Gough 2019; Stoddard et al. 2021). The insight that dramatic change is needed is far from new, as already 50 years ago, Meadows et al. (1972) depicted this need in *The Limits to Growth*. Despite this knowledge, there has been little substantial action.

While we are getting closer to reaching catastrophic tipping points in our ecosystems, societies continue to pursue fundamentally unsustainable activities. The provisioning systems perspective provides a critical bird's eye lens to understanding how and why materials are converted into goods and services, highlighting inefficiencies in the satisfaction of needs and unsustainability in different provisioning systems (Bärnthaler et al. 2022; Bayliss and Fine 2020; Fanning, O'Neill, and Büchs 2020; Fuchs et al. 2021a), including the key systems of mobility, housing, nutrition, and leisure (Koide et al. 2021). The literature suggests that effectively tackling the climate crisis will require substantial changes in societal, economic, political, and technological structures: prevailing unsustainable lifestyles and consumption patterns stem from various structural elements, including societal foundations, economic superstructures, policies, regulations, infrastructures, and the accessibility of technologies (Fuchs et al. 2021a). The overarching societal and economic framework, the broader system shaping human social functioning, must undergo a transformation toward alternative and sustainable approaches to constructing and construing our lives, with transformation understood as a fundamental change that reaches beyond small-scale or incremental "greening" of unsustainable practices within current power relations and patterns of resource use and exploitation (Brand 2016a). For

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this to be possible, a critical interrogation of societal, political, and economic structures and their role in preventing transformation is required.

While the urgency of transforming provisioning systems from rent-seeking to need-satisfaction is increasingly evident and discussed in research, the process of how to bring about this change remains unclear. In consequence, this article aims to identify relevant key structural barriers to a needs-oriented transformation of provisioning systems toward enabling 1.5° lifestyles and to explore stakeholder and expert views on strategies for overcoming them. In pursuit of these objectives, the article empirically draws on the results of 36 expert interviews and five Stakeholder Thinking Labs, using the backcasting method, conducted in five European case countries (Germany, Hungary, Latvia, Spain, and Sweden). Stakeholder Thinking Labs are an experimental workshop format that brings together diverse local stakeholders to collaboratively address and devise solutions for local challenges to transformation, fostering co-creation of insights that can subsequently inform broader projects (Vadovics et al. 2024). The backcasting method was chosen for this lab to enable participants to think out-of-the-box solutions to "deadlocked" structural problems. The results show that there is broad agreement on the need for deep structural change, but that it is extremely difficult to agree on concrete measures for such change and to identify actors willing and able to bring it about. Stakeholders across the case countries see the state, municipalities, and government institutions as responsible for steps toward specific transformations in provisioning systems (e.g., "fossil fuel-car tax"), but find it difficult to think about intermediate steps to achieve these goals. Experts suggest that a transformation of the state and its institutions is required for overcoming deep barriers, also offering insights about this change. However, many remain pessimistic about the outlook for such transformations.

The article proceeds as follows. The next section outlines the provisioning systems framework and relates it to achieving ways of life in line with the 1.5 °C limit. In the third section, we detail our multi-step methodological approach, specifically the expert interviews and backcasting Stakeholder Thinking Labs. We then provide key empirical findings in the fourth section, discuss these outcomes in the context of the framework and wider literature in the fifth section, and provide a few conclusions in the final section.

Background and framework

In this article, we discuss the (social-ecological) transformation of provisioning systems to enable 1.5° lifestyles through (deep) structural changes. We see the transformation of existing societal structures and provisioning systems as essential to enabling lifestyles consistent with limiting global temperature rises to 1.5 °C. This, in turn, implies the need to focus on the interplay between the broader socio-environmental context and individual behaviors to enable climate-friendly or 1.5° living (Aigner et al. 2022; Koide et al. 2021).

"Structure" is a vague and complex concept employed very differently by different disciplines as well as individual scholars and practitioners – see for example Giddens (1984). In this article, we take a pragmatic approach (cf. Aigner et al. 2022), understanding structures to be formal or informal as well as ideational or material institutions and systems of patterned behavior. To the extent that agents are born into preexisting structures, as well as preexisting provisioning systems, structures precede agency. Nevertheless, we can consider structures as constraining or enabling but not determining agency, and agents do also shape structures (cf. Hirth et al. 2023). In this context, we use the term "lifestyles" to denote aspects of consumption over which the agent or actor has some degree of individual choice, understanding that lifestyles are enabled or constrained by structures within different provisioning systems. A transformation toward provisioning systems that enable "climate-friendly living" (Aigner et al. 2022), "solidary modes of living" (Brand and Wissen 2013), or "1.5°(C) lifestyles" (Hirth et al. 2023; Newell, Twena, and Daley 2021) suggests a change toward ways of life that prioritize climate-friendly practices and ensure the long-term preservation of a climate conducive to a high quality of life. In envisioning such a transformation, the approaches named share an understanding that societal transformations toward sustainable pathways should not primarily focus on individual behavior change, but on the framework conditions within which daily life takes place – the structures in which behavior is embedded (Hirth et al. 2023).

Provisioning approaches focus on human well-being and the satisfaction of basic needs within environmental limits (cf. O'Neill et al. 2018), highlighting how physical infrastructures and societal institutions translate resources into human-needs satisfaction (Bärnthaler et al. 2022; Fanning, O'Neill, and Büchs 2020; Schaffartzik et al. 2021). Figure 1 depicts our understanding of these interrelations, and the role that structural barriers play in creating obstacles to the transformation of provisioning systems toward a needs-focused orientation. In the literature on sustainable consumption and lifestyles, mobility, housing, nutrition, and leisure are considered key fields or

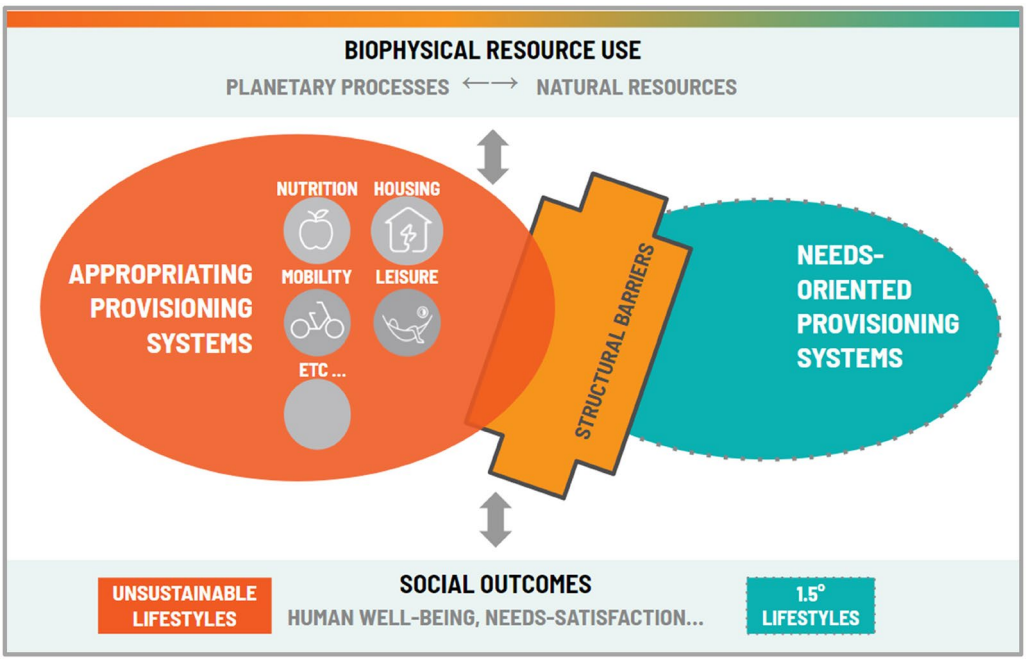

Figure 1. Provisioning systems: translators of resources into needs-satisfaction (Adapted from Fanning, O'Neill, and Büchs 2020).

provisioning systems for transformation toward sustainability (Koide et al. 2021). There are different provisioning systems for meeting different human needs, with each system comprising both physical (including environmental and technological) and social (including cultural, political, and economic) structures and dynamics (Gough 2019). The aim of the provisioning systems approach is to understand how sets of related elements work together to transform resources to meet (or fail to meet) a foreseen human need or want: an orientation toward objective needs that are limited and can be met should be prioritized in a world of limits (Fuchs et al. 2021a; Fanning, O'Neill, and Büchs 2020).

Applying the provisioning systems lens, scholars have highlighted appropriating provisioning systems as key structural barriers to sustainable livelihoods and sustainability transformations (Fuchs et al. 2021a; O'Neill et al. 2018; Schaffartzik et al. 2021). These studies argue that in Europe, market-based and globalized provisioning systems have increasingly led to the prioritizing of rent-seeking over human-needs satisfaction over the last 50 years: systems which fail to meet human needs while also overconsuming resources and creating adverse environmental outcomes, tending toward an inefficient allocation of goods (Fanning, O'Neill, and Büchs 2020; Schaffartzik et al. 2021). If there is no "limit" to profit-maximizing, the system will eventually run into environmental limits to production, given that a decoupling of economic growth from emissions fast enough to stay within the 1.5 °C limit is not within reach (Vogel and Hickel 2023; Wiedenhofer et al. 2020). In purely market-based systems, there is also no floor, or guaranteed minimum level of consumption, which is a problem for societal welfare (Fuchs et al. 2021a). Differentiating between needs and wants, studies drawing on the provisioning systems approach also emphasize the necessity and ability to stay within (upper) consumption limits via a focus on efficient means of needs satisfaction, questioning the drivers of demand (Brand-Correa and Steinberger 2017; Fuchs et al. 2021a; see also Bärnthaler and Gough, 2023, in this special issue). While social norms influence understandings of which need should be satisfied in what way, historical contexts and past events, policies, and practices shape material infrastructures (Schaffartzik et al. 2021). Together norms and (distributions in) material resources also create historical legacies of accumulated power (Bayliss and Fine 2020).

Bärnthaler et al. (2022) argue that transformative agency within different provisioning systems requires structural change in the form of an actualization of different causal mechanisms, tailored to specific contexts, not just implementing the same causal mechanisms in novel ways (e.g., not just the "greening" of production but challenging structural power and the aim of capital accumulation in appropriating systems). But while the transformation of provisioning systems from appropriating toward needs-satisfaction systems is more urgent than ever, it remains unclear how this change should come about. On one hand, state intervention is deemed indispensable for effecting change and in establishing the framework conditions for sustainable lifestyles, but, on the other

hand, to enable more substantial state intervention, broader democratic support for a sustainability agenda must be secured. So far, transformative policies that would challenge the structural power of elites and the aim of capital accumulation, have not been observed (Hausknost 2020; Douglas 2020). In the context of environmental crises, individuals are held accountable for systemic outcomes over which they have little control, and they are expected to make the correct (consumption) choices (Maniates 2001); yet individuals also eschew responsibility where they have it, expecting the state to act, even where it cannot (Douglas 2020).

Recognizing the need to critically examine pathways for transforming provisioning systems, this article focuses on expert and stakeholder views on transformative change. We first analyze expert views on key structures that impact lifestyle sustainability and proposals for implementing change. We then investigate stakeholder views on the actualization of core structures in different provisioning systems (food, mobility, housing, and leisure), steps toward change, and stakeholder views around responsibility for change. In the next section, we briefly present our methodological approach.

Methods

The methodology and analysis used for this article are part of a larger, four-step process (see Figure 2). In the following discussion, we build on Steps 3 and 4. The approach is abductive, a combination of both inductive and deductive methods, with the literature review (Step 1) and expert interviews (Step 3) involving inductive reasoning by exploring and gathering information, and the Delphi process (Step 2) and Stakeholder Thinking Labs (Step 4) involving deductive reasoning by seeking consensus and applying knowledge in specific contexts (Magnani 2005). The first two steps and their specific results have already been published elsewhere (Hirth et al. 2023), and thus will not be detailed here further. The overall result of these first two steps was the identification of 22 structures considered to be most relevant for transforming toward 1.5° lifestyles (available as Table A1 in the Appendix). Step 3 involved expert interviews and Step 4 stakeholder dialogues, each carried out in five countries (Germany, Hungary, Latvia, Spain, and Sweden), with expert interviews in addition being conducted at the international level. The selection of the case countries provides a diverse representation of European Union (EU) member states. These selected countries were chosen strategically to capture variations in geographic location, historical backgrounds (including post-Soviet experiences), cultural contexts, and socio-economic conditions. This intentional selection aims to offer a comprehensive overview of the European landscape, ensuring that insights and perspectives gathered from stakeholders in these countries contribute to a holistic understanding of the European context.

Expert interviews

In Step 3, we conducted 36 semi-structured expert interviews: five per case country and 11 with international experts, selected for their expertise in structural transformation, including specific provisioning systems. Expert backgrounds are detailed in Appendix Table A1. Roughly two-thirds were academic experts, the remainder practitioners in various science-policy roles, including with think tanks, consultancies, and nongovernmental organizations (NGOs) focusing on sustainability and fair trade.

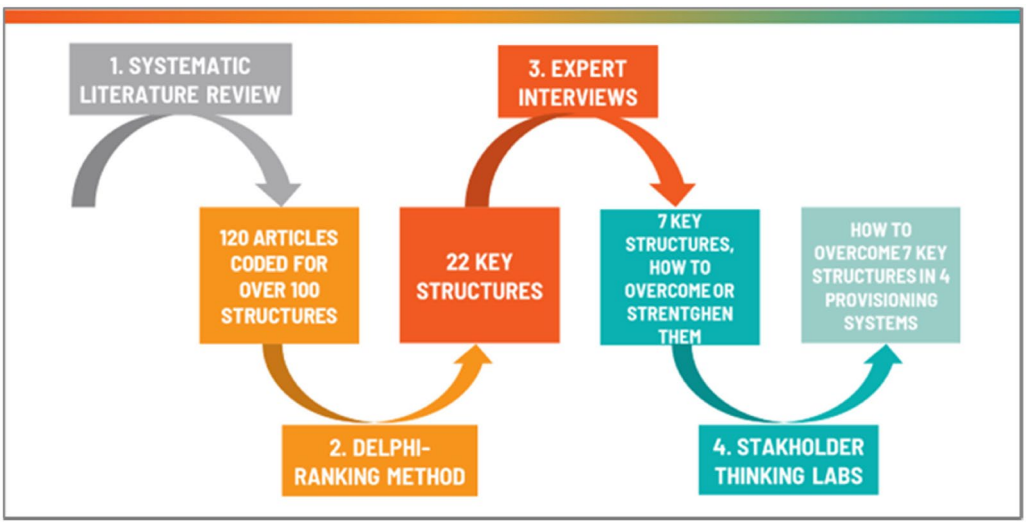

Figure 2. Four-step empirical process.

This table not only profiles interviewees but also assigns an Interview ID for subsequent analysis. Two-thirds of respondents were academics (social and natural sciences), with the remaining third being practitioners in the field.

During the interviews, experts were presented with a list of 22 structures identified in previous steps (Table A1 in the Appendix) and asked to identify which they considered most impactful for facilitating or impeding transformative changes to 1.5° lifestyles and provisioning systems (Interview Guidelines: Table A3 in the Appendix). They were also asked to suggest ways to overcome or reinforce these structural factors. The ranking of structures has a quantitative appearance but should not hide the fact that, as part of the qualitative data collection and analysis, researchers and participants had to take many steps of knowledge translation and interpretation to move between abstract and more concrete categories and measures.

Stakeholder Thinking Labs

In Step 4, 20–25 participants from business, academia, civil society, policymaking, and the media (see Table A4 in the Appendix) in five EU countries took part in Stakeholder Thinking Labs with the aim to relate the seven key structures identified by the experts to concrete measures, highlighting how these structures materialize in different provisioning systems and exploring steps to overcome them. The Stakeholder Thinking Labs were conducted in the local language in each of the case countries. The excerpted quotations that appear below were translated by the authors or project partners.

To enable stakeholders to envision transformative change, the labs employed backcasting, a technique that imagines a desirable future and identifies steps to achieve it (Köves et al. 2013; Köves 2015). This approach aligns with "futuring" in transformation research, which envisions an alternative "emancipated horizon" to inspire transformative action (Brand 2016b, 104). Participants in the labs first engaged in a serious game, the Climate Puzzle, to grasp the concept of 1.5° living, experiencing individual consumption reductions in mobility, housing, nutrition, and leisure (Koide et al. 2021; Vadovics et al. 2024). After this, a scientifically researched vision of 1.5° living in the future was read to participants by the lab host in the form of a meditative 15-minute imaginary "walk," envisioning life in 2040 (2050 for Hungarian participants due to the difficult political context and other challenges in imagining change), focusing on changed provisioning like reduced meat consumption and improved public transport. Divided into four working groups for the four provisioning systems, participants were then asked to focus on how the seven structural barriers in their provisioning system could be overcome. Following the labs, all the data and policy measures collected in each case country were digitized into electronic spreadsheets and merged into one large database.

Methodological limitations of the work remain, notably in the need to adapt particular features of the labs to suit local contexts. It is also important to note that this article aims to provide an overall analysis, overlooking differences between case countries, which cautions against universal interpretations.

Findings

Expert interviews

Figure 3 shows the list of seven key structures identified by the experts as most important for enabling or hindering 1.5° lifestyles. The list is ordered according to the number of experts that chose the particular structure as being the most impactful. While each of the 22 structures provided to the experts (see Table A1 in the Appendix) was chosen by at least three experts out of the 36, the seven key structures were chosen by 11 or more experts. Yet, there are still significant differences when it comes to the frequency among the seven key structures. Being selected 23 times, the economic growth paradigm (Structure 1) received by far the most votes. Lack of consistent policies (Structure 2) and vested interests (Structure 3) were both selected 13 times, and Structures 4–7 were identified 11–12 times. It is noteworthy that, of their own accord, experts chose structures that had previously been classified as deep structures (Hirth et al. 2023) which may be hard to change as they are embedded in power relations and broadly shape the societal and economic order but have particular leverage to achieve climate targets.

Structure 1: the economic growth paradigm

Experts highlighted the structure of the economic growth paradigm as the most impactful barrier. In their view, economic growth is a powerful narrative with a deep structural impact that incentivizes different economic, political, and social actors and individuals to contribute to pursuing growth in their different fields of action. They compared growth to a "magnetic mechanism" even for seemingly alternative actors like the German Green Party (DE2). Experts saw its significance especially in interlinkages with other structural barriers related to belief in the power of markets and market-based systems (INT3), which has been absorbed and mainstreamed

Figure 3. Seven key structures for 1.5° lifestyles.

by policy makers, influencing economic, environmental, and social policies everywhere (INT1). The paradigm also impacts North-South relations, leading to pursuit of profit maximization over social welfare, e.g., in the context of infrastructure construction in the global South (INT1, INT2). Given its deep embedding in behavior and decision frameworks of actors in the socio-economic system, experts underlined that moving away from the goal of economic growth would mean fundamentally changing the socio-economic system(s) (INT7).

Structure 2: creating consistent policies and Structure 4: giving economic incentives and internalizing environmental costs in prices

Answers to creating consistent policies and internalizing environmental externalities overlapped to some extent and are thus presented together. Experts considered these structures key for the transformation, including the regulatory measures and incentives necessary to drive change, and as a basis for collective efforts to maintain motivation and their acceptance (DE5). Policies shape household access to certain technologies and renovation measures, i.e., opportunities for reducing their household footprints (ES3). Experts noted that the issue of consistent policies was intimately connected to the issue of the economic growth paradigm, since governmental policy objectives prioritized economic growth in the current economic system. They also pointed out that policies can be considered to represent the lock-in effects of past decisions that are difficult to change, even if contributing to environmental destruction, and that such dynamics are especially visible in the cases of mobility and housing (INT2).

Structure 3: overcoming vested interests

Experts considered the power of vested interests in the political process to be a key barrier to transforming lifestyles. They differentiated between two types of vested interests. First, they saw vested interests as deriving from capital that has already been invested in provisioning systems in the form of unsustainable technologies and commodities, e.g., the combustion engine (INT4), and related alignments such as between the car industry and the

government in Germany (INT9). Similarly, experts noted that big agrifood and chemical corporations maintain dominance and prevent alternative approaches such as community-based agriculture in the context of nutrition (INT2). They perceived such vested interests to outweigh any pressure toward change by progressive companies, (a few) politicians with more ambitious climate agendas, and parts of the public (DE5).

The second type of vested interest, however, means that the position of the public has to be seen ambiguously as well, according to the experts. Specifically, the experts argued that many households also have vested interests in fossil fuels, or rather the practices enabled by burning them, due to their possessions (LV4). This is not to say that households explicitly demand fossil fuels, but that they are structurally locked into practices and services that currently rely on fossil fuels. Further, the experts highlighted that many jobs are related to existing business models, leading to an additional interest in keeping things the way they are.

Structure 5: strengthening alternative narratives

With respect to the structure of alternative narratives and measurements of the good life, many of the experts noted that existing hegemonic narratives reinforced many other structures, especially the economic growth paradigm, creating together "one of the fundamental problems" (INT8) given that "economic growth is institutionalized…through narratives and measurements" (INT7). They also stressed that the dream of high consumption – "living the American dream of having a bigger house, bigger car, and catching up with West in material welfare" – was a key barrier to societal transformation, as "the bigger the better" was a strong narrative, also in European peripheries (LV2). Experts tied this narrative of material and luxury consumption as the good life, based on ideas of "wanting to be like the West," to experiences of past poverty and insecurity, with which alternative narratives of the good life would have to contend (LV3), especially to the extent that alternative green narratives were seen as dictated by the outside, specifically the EU (LV2). The structure highlights the limits of an emissions-focused approach and the need for wider cultural and psycho-social change, or the "need to really start talking more about a broader concept of what it means to lead a good life" (INT5). Interviewees argued that new indicators beyond simple measurements of gross domestic product (GDP) were needed for "mainstreaming sustainable consciousness" (INT2) noting that currently most measures were still based on GDP (or gross national product) while alternatives such as the "HPI [Happy Planet Index], Eco-Footprints, or HDI [Human Development Index]" were not being used (HU3).

Structure 6: overcoming inequity

With respect to inequity, experts highlighted its reinforcement with respect to most other structures, including the economic growth paradigm, vested interests, and narratives of the good life. They explained that inequity "is a fundamental problem for everything" (LV6), "might be the most important, overarching structure that determines a lot of the other [structures]" (INT3), and is "a cross-cutting issue" affecting all provisioning systems (INT6). Experts noted that inequity frames actors' "space of action" for bringing about change – in highly unequal systems, those with power (financial or other material resources, knowledge, access to politics) typically benefitting from the status quo can impose their will and stop transformations (INT6). Conversely, they highlighted the limits of action for those with the least power, who tend to be the most affected by climate change: "It is absolutely naïve to hope that this group will fight for the climate at a time when they have not been able to buy normal food for the last four years" (LV6). In addition, they pointed out that inequities are also "instrumentalized by certain actors to prevent change" by, for example, populist appeals to social justice to delay climate action (INT9). Accordingly, addressing the environmental crises requires addressing inequity and facing "all the crises that go along with it" (LV6); in other words, "if transitions will not be just, then there just won't be a transition" (SE1).

Structure 7: education

Interviewed experts considered current educational institutions and curricula an important structure and lever for change. They noted its intersection with multiple others, including the economic growth paradigm. Education currently is endowing a workforce with information and skills geared toward economic growth rather than sustainability, thereby highlighting the need for a systemic "change in mindset" (ES1). Schools were considered "way more effective systems than [sustainability] campaigns" (ES2), while "education campaigns," were considered a powerful tool "in combination with active public participation" (LV1). Experts stressed the role of educational institutions in promoting "collective knowledge," enabling individuals to critically evaluate society and their own actions, a crucial enabler of change in all structures (ES2). Current educational institutions

were arguably "fail[ing] to foster critical thinking" (DE4), due to a lack of holistic information provision on sustainability (HU3), a transformation barrier, as kids are "very open to change" unlike older generations (DE4). More offers of higher and life-course education were considered necessary: "sustainability education should be implemented in all educational facilities and in each and every profession, also apprenticeships" (DE1). Some experts noted existing sustainability-focused "education-research infrastructure" as a positive enabler (HU5). When considering institutional changes as an avenue toward broader societal change, interviewees focused on education policy in particular (ES2 HU4, HU5). They also pointed out the importance of communication between academia and society (INT9) especially through a "communications offensive" bringing the destruction of the economic system and its global/local inequities to the fore (DE2), while drawing on key scientific and academic contributions such as the IPCC and reports from the Intergovernmental Policy Platform on Biodiversity and Ecosystem Services (IPBES) (INT6).

Change in the key structures and how to achieve it

As the previous discussion shows, the experts highlighted how reinforcing structures hinder transformation. They discussed systemic change in several or even all of the seven structures together and noted simultaneous changes in these structures as implying a fundamental change "in social relations, property relations, political priorities, to counter status, to counter profit-making and the accumulation of capital" (INT6), basically "changing the goal of the system and thus changing the whole system" (INT7). At the same time, most experts were pessimistic about the possibilities for transformation considering the depth of changes needed and due to the combined strength of these self-reinforcing deep societal structural barriers: "[I]f this question were answered [overcoming the economic growth paradigm], we would be awarded the Nobel Prize in Economics" (HU3).

The experts considered the "repolitization" of environmental crises by social movements and civil society to be important, as strong bottom-up movements could "force politics to regulate differently" (DE2), while grassroots movements could "show alternatives" for society (DE5) –"starting from social movements, [to] shifting discourses and shifting the windows of opportunity" (INT3). Many of the experts noted that it was overwhelmingly thanks to grassroots movements that change was achieved in the past (INT6, INT9, HU2): "Pressure and repeated demand is needed from within society to highlight that 'We want those changes!'" (DE5). This "political will" was considered essential for changes in policy (LV3), and wider changes in consciousness, specifically the ability of citizens to see themselves "as part of the world" (LV6). Experts also argued for more citizen participation, trust, and direct democracy as vehicles for change (DE4, SE1), with popular consciousness and pop culture needing to be challenged to change the dominant discourse, so that 1.5° lifestyles were no longer "for marginal groups" only (LV2), a "consumption rebellion" against the "winners" could bring political pressure (ES4). At the same time, however, many experts expressed skepticism about the speed and extent of grassroots-driven changes: "I don't know how to do it, we are betting on counter power within society from the bottom up [which] is not really happening. Those movements that are trying to move toward 1.5° lifestyles haven't really achieved this" (INT3).

Stakeholder Thinking Labs

In the following subsection, we present key measures for sustainability transformations for the four provisioning systems of food, housing, mobility, and leisure, as suggested by Stakeholder Thinking Lab participants. Importantly, and similarly to the experts, stakeholders noted that the structures overlap and intersect, and therefore discussed them not only individually, but in terms of their interactions. Accordingly, they often assigned certain actions to several structures, highlighting the importance of taking a systemic view of the process of change. Participants also noted that policies overlap between provisioning systems (e.g., policies for 15-minute cities have implications for mobility and housing).

Transforming provisioning systems

In the labs, stakeholders developed ideas for overcoming structural barriers to 1.5° lifestyles in the four provisioning systems and for enhancing enablers of sustainability. To do this, they considered how the seven structures were relevant to the provisioning system in question, developing an understanding for how invisible and complex structures "materialize" in visible and particular ways in different systems. On this basis, they then discussed ways of overcoming or strengthening them (over 700 measures). Table 1 provides a snapshot of the results for each of the four provisioning systems.

Translating the seven key structural barriers to the food-provisioning system, for instance, stakeholders discussed the drive for economic growth in the food industry, the power of vested agribusiness in

Table 1. Transforming the seven key structures in concrete provisioning systems.

	Nutrition a. How do structures materialize? ; b. How can they be transformed?;	Housing a. How do structures materialize? b. How can they be transformed?	Mobility a. How do structures materialize? b. How can they be transformed?	Leisure a. How do structures materialize? b. How can they be transformed?
1. Dominance of the growth paradigm	Growth driven food industry; Lacking resource efficiency and need satisfaction in terms of food provisioning	Growth-driven unsustainable construction industry; Profit- oriented provisioning of housing on the rental market; Lack of need-satisfaction in housing	Growth- and profit-orientation of auto and aviation industry; Lack of needs-based mobility solutions	Growth-driven nature of the energy-intensive tourism and leisure industries
a b	Shortening of supply chains and promoting local food production and consumption; Transitioning to a circular food provisioning system; Promoting recyclable packaging, and reduce plastic use, reduce and avoid food waste	New shared and co-housing solutions; "Richness line" of maximum living space and eco-social taxation; Collectivizing living space; Moratorium on new buildings	Minimizing the need for commuting and kilometers traveled per person; Bans on fossil-fuel individual vehicles	Decarbonizing leisure activities: breaking with current economic practices; Identifying working time reduction as a key strategy to alleviate pressure and allow individuals to engage in more sustainable leisure activities, as well as activities like volunteering; Shifting away from linear consumerism as leisure; Creating an urban sustainable leisure infrastructure, including consumption-free spaces
2. Inconsistent policies	Insufficient consideration of environmental impacts in food policies	No consideration of environmental impacts of construction, or lifecycle emissions, or use of buildings	Unsustainable mobility policies (nationally and in the EU) dictated by vested interests	Inadequate policies for regulating the sustainability of tourism
a b	Reassess the system's ability to satisfied nutrition-related needs; Integrate sustainability goals into public procurement and introduce comprehensive tax policies; Promote bottom-up participation (e.g., local citizens' councils); Policies to reduce the consumption of animal products and shifts toward organic food production (taxes, bans or subsidized plant-based food)	Regulation around new construction (i.e., more sustainable material use, limits to new construction); Policies to make energy communities easier	Improving shared and public transportation, including policies for better rail connections and railway infrastructure, the development of multimodal travel options, the electrification of buses, and improvements in bicycle infrastructures; Banning or taxing of unsustainable modes of transportation; For individual car mobility: banning car travel in certain areas, speed limits, bans/taxes on fossil-fuel vehicles; Strong, consistent, and binding local and state level objectives, climate policies, and accountability mechanisms	Promotion of sustainable business models, such as renting, secondhand, and repairing goods; Regulating aviation and car industries and ensuring realistic pricing via taxes and monitoring of travel emissions; Promoting public transport and sustainable modes of travel (e.g., travel vouchers, reduced/free prices, improved railway infrastructure, expansion of night train network, investments in walking/cycling infrastructures); Ensuring local citizen participation in policymaking around the provisioning of local leisure services
3. Influence of vested interests	The power of vested agribusiness interests and their policy-setting power	The power of construction industry, owners of building stock, real estate investors	The rule-making power of car, fossil and aviation lobbies	Vested interests of airlines and other tourism related companies
a b	Progressive taxes on ecologically responsible land use and VAT exemptions for local plant-based and organic options; Taxing private assets and land not in use (exempting agricultural areas set aside for biodiversity purposes) and creating incentives for sustainable farming; Reassess financial incentives and subsidies provided by governments to large-scale agribusiness; Transparent communication mechanisms between government and business, measures to ensure the separation of economic and political (agribusiness) interests; An increased integration of expert knowledge in decision-making processes; Democratic citizens' councils around food provisioning and an increased representation of environmental lobbyists in advocating for sustainable food systems	Regulation of rental market to disincentivize profit-seeking over needs-satisfaction; Public housing investments to overcome power of vested interests in the rental market; Social rent controls; Green construction regulation, including on reusing materials; Better government-municipal incentives for community-led housing	Identifying and supporting lobbies advocating for and better infrastructure and cycling; Counteracting the influence of industry lobbies through better media oversight and strategic actions, including restricting the influence of automobile lobbies in city planning	Policies to curbing private vested interests and suppressing lobbies (e.g., curbing the power of aviation companies, banning empty or near-empty flights); Citizens counter-lobbies (e.g., for cycle infrastructure)

(*Continued*)

Table 1. Continued.

	Nutrition a. How do structures materialize? ; b. How can they be transformed?;	Housing a. How do structures materialize? b. How can they be transformed?	Mobility a. How do structures materialize? b. How can they be transformed?	Leisure a. How do structures materialize? b. How can they be transformed?
4. Externalization of environmental costs	The externalization of environmental costs in food policies	The externalization of environmental impacts of construction and life-cycle emissions of buildings	The externalization of environmental costs in mobility policies	A lack of internationalization of its environmental and social impacts
a b	Taxes on unsustainable practices, bans on harmful substances and carbon-intensive foods, and the removal of environmentally harmful subsidies in agriculture	Lifecycle costs and impacts included in taxes for new construction (i.e., through carbon tax); Tax incentives for heating system renovation	The introduction of environmental costs through green taxes in mobility	The introduction of environmental costs through green taxes in mobility
5. Hegemonic narratives of the good life	Narratives and social norm-setting around unsustainable food consumption through advertising	Changing narratives around the primacy of real estate ownership	Narratives around car ownership and flying as desirable and acceptable	Narratives linking carbon-intensive leisure activities to ideas of a good life; Changing societal narratives away from overconsumption, in general, to allow a wider paradigm shift toward experiences and recreation in nearby areas, volunteering, and community membership as part of a good life
a b	Promoting a vision of 1.5° compatible food systems; Change mainstream media portrayals of farming and food; Engage influencers to promote alternative narratives around food	Media campaign for communal living projects; Trial periods for communal housing to change perceptions; "Housing match" to target loneliness and promote new communal ways of living	Communicating different visions of future mobility; Developing pride in car-free or cycling cities, and leveraging mass culture to shape perceptions; Promoting the benefits of improved quality of life and positive visions of the necessary mobility transformation; Organizing car-free weeks to foster cultural change in mobility consumption	Rewarding and promoting local communities who are creating examples of alternative ways of life and leisure; Promoting working time reduction and volunteering for new narratives of a good life
6 Inequality	Inequities in food provisioning	Inequities in housing provisioning	Inequities in mobility provisioning	Inequities in access to leisure services
a b	Increasing resource efficiency of food provisioning while ensuring needs satisfaction in food provisioning systems; Redistribute surplus food; Engage a broad range of system-based actors in the promotion of localized supply chains and in the balancing food supply and demand; Policies to help small-scale organic producers compete with large agribusiness actors	Minimum and maximum sqm living space; Access to green spaces codified in law; Social rent control; Social housing policies reinvigorated	Improving access to public transport and micro-mobility infrastructure; Offering cheaper or free public transport services; Ensuring better frequency and interlinking of different modes of transport, and providing better rural public transport; Better safety measures for cyclists and pedestrians, particularly for women; Instating mobility rights; Reducing the amount of public space awarded to cars in the city, including the repurposing of parking spaces as small parks	Address interconnections between the provisioning systems of leisure, nutrition, housing, health, and mobility, with measures aimed at socially and environmentally sustainable, meaningful activities and nature-centered approaches to leisure and tourism; Create a campaign for prosocial leisure and tourism to support socially disadvantaged groups in accessing cheap or free opportunities for leisure
7 Lack of information and skills	Lack of education and information around sustainability in the consumption of food	Lack of education and information on sustainable construction and renovations	Knowledge and information gap on sustainable mobility	Need for more education on sustainable leisure practices and information on their availability
a b	Incorporate sustainable food education in educational institutions; Organize events and public information programs that promote sustainable food choices	Vocational training for housing rehabilitation; Workers training laypersons about energy renovation; Sustainability-focused education in schools on reducing energy use; Construction, architecture and design graduates taught competences in sustainable construction, reuse and life-cycle analyses; Integration of sustainability and climate issues in community housing education platforms	Schools to promote and facilitate (information about) alternative and active forms of commuting and incorporate relevant sustainability and climate change topics in curriculum; Lifelong learning opportunities about climate change and sustainable mobility	Need for education initiatives on the impact of leisure on sustainability; Vegan cooking, mending and repairing, food growing classes as new subjects in schools; Public campaigns promoting healthy and sustainable sports as leisure activities, combined with free or cheaper access (e.g., train tickets); Education about volunteering in schools; "Adopt a tree/adopt nature" projects in settlements/cities to raise awareness, connect people to nature, and give people a "hobby"

policy-setting, the insufficient consideration of environmental impacts in policies, the externalization of environmental costs in food policies, narratives and social norm-setting around unsustainable food consumption through advertising, inequity in food provisioning, and lack of education around sustainability in food consumption. Similarly, they highlighted the role of economic growth in fostering resource use; the lack of adequate policies for affordable quality housing and the insufficient consideration of the environmental impacts in construction; the power of vested interests in the construction, real estate, and banking industries; the unsustainable narratives of larger homes as better; the large levels of inequity in housing; and the lack of knowledge about sustainable construction practices for the housing-provisioning system. For mobility, stakeholders connected the structure of the economic growth paradigm to the automobile industry and aviation lobby, with the power of the car, fossil fuel, and airlines as vested interests, considered as dictating unsustainable mobility policies in the EU (without internalizing the effects on the environment), and promoting narratives around vehicle ownership and flying as desirable and acceptable. They also discussed the inequities in mobility provisioning and overcoming the knowledge and information gap on sustainable mobility. Finally, stakeholders underlined the growth-driven nature of the energy-intensive tourism and leisure industries, the vested interests of airlines and other tourism-related companies, the inadequate policies for regulating the sustainability of tourism, the narratives linking carbon-intensive leisure activities to ideas of a good life, the inequities in access to leisure services, and the lack of and need for more education on sustainable leisure practices in terms of the role of the seven key structures in leisure provisioning.

The common denominator of the measures proposed by stakeholders across all provisioning systems and case countries was the attempt to find ways to increase resource efficiency while ensuring needs satisfaction. Overall, the measures proposed included policy sticks (bans and taxes), carrots (subsidies), and attempts to influence cultural norms. Of particular note was the willingness of stakeholders to embrace the idea of strong policy measures such as bans (for example on flying, urban driving, sugar, and advertising), the use of taxes (for example on car use, flying, square meters of living space, and pesticides) to discourage unsustainable forms of consumption, and the preparedness to consider limits to consumption. Similarly, participatory forms of decision-making and collective/public forms of provisioning (for example for better public funding for cheaper or free direct provision of goods and services, public transport) received considerable attention. Strategies to counter dominant cultural norms were also raised in many cases (for example advertising and social media campaigns).

Discussion

Examining both expert interviews and stakeholder labs reveals three notable aspects: (1) a focus on the interaction between key structures and their stabilizing impacts, (2) a readiness to pinpoint actionable measures for change despite the perceived structural stability, and (3) an assignment of responsibility to the state with lingering doubts about the actual implementation of necessary steps.

First, both experts and stakeholders acknowledged the interaction of key structures, across provisioning systems, and their stabilizing effects when discussing structural barriers to a 1.5 °C-aligned transformation. For example, they pointed out how the growth paradigm is mutually upheld and reinforced by vested interests and hegemonic narratives of the good life, and how material and ideational dimensions interact in this context. The economic growth paradigm, for instance, might be considered an ideational force, but dominant beliefs in how the market works have material effects, which in turn reinforce and sustain ideology. Similarly, narratives of the good life or education might be considered ideational at first glance, but they too, as well as all the other structures, have material and ideational traits. The literature has also highlighted this interaction and underlined its stabilizing effect in the form of a "material culture" (Bayliss and Fine 2020).

The interviewed experts and lab participants highlighted how the interaction between the key structures works to reinforce appropriating forms of provisioning, reflecting the rich literature on trends toward increasing individualization and commodification of provisioning over the last 50 years, fostered by the dominance of the neoliberal paradigm (Schaffartzik et al. 2021; Fanning, O'Neill, and Büchs 2020). Financialization and commodification, especially as financial practices extend into all aspects of daily life, across cultures, have transformed public services into business opportunities, profoundly shaping most provisioning systems (Bayliss and Fine 2020). In housing, this manifests in inefficient and unsustainable provisioning, including the overproduction of luxury and underproduction of affordable housing. Similarly, in the food system, there is overproduction of food, especially unsustainable meat production, parallel to a lack of access to quality nutrition. Mobility systems give rise to unsustainable overproduction of private transportation, while leisure is increasingly commodified and privatized.

Second, and related to the above point, interviewees and lab participants agreed that the question of how to bring about deep structural change toward needs satisfaction is difficult, in this situation. They nevertheless identified (over 700) strategic, concrete steps to move forward, which contrast interestingly with literature in the field. By focusing on tangible initiatives while acknowledging the difficulty of achieving the needed structural changes, stakeholders linked the need for transformation to practical measures fostering transitions.

Interviewed experts also suggested smaller steps that build on each other, in pursuit of comprehensive structural change, mirroring the stakeholders' approach and discussions in literature. They raised the possibility of a "Trojan-horse method" of inducing societal change via implementing different policies to reduce "the importance of the economic growth paradigm" (INT7) as a means to slowly move society "forward from the ideology" of the economic growth paradigm (INT8), as well as creating (outside) structures parallel to existing logics – through counter blocks to vested interests responsible for (energy) provisioning (INT6). They noted the importance of getting into and "changing institutions first," as the initial step to "enable change" (DE3), highlighting the importance of using windows of opportunity (INT7), such as during the era of transformation from socialism in the 1990s (HU1). Experts highlighted the need for "a shared key message" and platform among progressive forces and building broad coalitions reaching across ecological and social concerns (INT7), including coalitions with trade unions (INT4).

For the provisioning system of housing, stakeholder proposals for fostering the spread of shared and communal housing, state support for social housing, or regulations to support low-carbon renovations are similar to those made by scholars (e.g., Zu Ermgassen et al. 2022). Stakeholders, however, also suggested "a richness line" with respect to maximum residential space, a moratorium on new buildings, and the codification of access to green spaces in law – proposals that are raised less often in the academic literature on specific provisioning systems. It resonates, though, with the critical transformation literature that has raised questions of income and consumption maxima, for instance (Gough 2019; Fuchs et al. 2021b).

In a similar manner, the literature suggests that against the prevailing societal common sense, broader systemic transformations require strategically advancing reformist policies and practical, concrete steps that align with the vision of an "emancipated horizon" – where everyone's well-being is ensured without harming the environment (Brand 2016b, 104). Certainly, the measures suggested by participants provide a starting point and signal a wish for such an emancipated horizon. Thus, while the notion of a necessary transformation suggests deeper structural changes to existing (provisioning) systems than transition, the two objectives are not mutually exclusive (Pichler 2023).

To transform food systems, Béné (2022) highlights government action as necessary to disempower Big Food, aid smaller innovators, and steer innovation toward sustainability, while international organizations should foster global coordination, enforce norms, and hold governments accountable for wider transformation. Lab participants similarly emphasized government intervention to limit the power of vested interests (agribusiness), measures to tackle narratives around food, and even state responsibility for strong governance in the form of bans and taxes. Indeed, the breadth of steps identified by stakeholders was impressive and showed quite a comprehensive understanding of the needs for and challenges faced in transforming the food-provisioning system that the researchers and others also identified.

In mobility systems, Mattioli et al. (2020) recommend tackling interconnected elements of car-dependent transport systems, anticipating reactions from vested interests, promoting alternative transport modes as "comprehensive worldviews," emphasizing public transport alternatives for resource redistribution, exposing car-dependent systems, and advocating for a political program of research and action. The recommended steps align with suggestions from lab participants. Both recognize the interrelationship of technical-social-cultural interrelations, while simultaneously suggesting that a much stronger focus on the political power of the car industry is needed. In Mattioli et al.'s terms, it is necessary to overcome state capture by vested interests and state-dependence on the car industry (for jobs, economic growth, and public revenue). Stakeholders considered these relations in less theoretical terms, but, especially in Germany, still recognized the role of the sector in shaping the (un)sustainability of the provisioning system.

Leisure, though often overlooked as a distinct provisioning system, is essential to human well-being like food and shelter, and heavily influenced by appropriation dynamics (e.g., Sumner and Mair 2017). The increase in carbon-intensive leisure activities underscores its significance for human welfare and its connection with broader societal and economic structures (e.g., Wiedenhofer et al. 2020). It intersects with other systems including nutrition, mobility, and housing, demonstrating the complexity of transforming leisure (e.g., Bärnthaler et al. 2022). Stakeholders identified various barriers to 1.5° C-aligned leisure, including growth-driven tourism, insufficient leisure time, lack of sustainable regulations, and high-carbon activities driven by societal norms, which are also highlighted in

literature (Sumner and Mair 2017). Similarly, public provisioning of sustainable leisure facilities, education on sustainable leisure, reduction of working hours, support for volunteering, and equitable access to leisure for marginalized groups were solutions proposed by stakeholders and are discussed in the literature. Interestingly, issues such as the repolitization of leisure(time), international support for local resistance against commodification, and support for community-led initiatives, which some studies identify as relevant interventions (Fletcher et al. 2019) were not discussed broadly in the stakeholder labs. Overall, however, the breadth of measures that stakeholders were able to identify and willing to consider was impressive and reflects a diversity that is emblematic of academic discussions.

Most of the steps suggested by both experts and stakeholders, and this is the third important aspect to note, related to action by the state, municipalities, or other government institutions, which is a key issue. In the literature, approaches and steps to transforming any of the provisioning systems effectively first require a transformation of the state to overcome state interests in jobs, growth and state revenues – from the meat, car, or construction industries – and also state capture by "Big Food," the automobile industry, and real estate interests (e.g., Béné 2022; Mattioli et al. 2020; Zu Ermgassen et al. 2022). Interviewees and lab participants were also confronted with the question of the role of the state and state institutions. In the interviews, experts emphasized the need to transform the welfare state and state institutions in particular. State action and transformation was seen as crucial to overcoming the economic growth paradigm, vested interests, and alternative narratives of the good life, although experts acknowledged that "it is hard to fathom how to get there and one can only name small steps toward that goal" (DE3). Stakeholders' suggestions for change also relied heavily on the willingness of governments to take action. Bans and taxes, as well as broader regulation, depend on an active state.

Interviewed experts and lab participants struggled with envisioning how the implementation of transformative measures could come about. Given their recognition of the strong and stabilizing effect of the key structures and their interaction noted above, this is not surprising. Indeed, researchers have also highlighted the challenge of a transformative state, arguing that the expectation that states should and can act effectively in pursuit of sustainability is problematic in so far as broader democratic legitimation in the current era is based on enabling private overconsumption and promoting economic growth (Hausknost 2020; Douglas 2020). They suggest that prevailing notions of subjectivity and autonomy that rely heavily on consumption remain largely unchallenged despite contradictions with equality and justice ideas, which undermines the potential for wider societal considerations and support for state-led transformation (Blühdorn 2023). Arguably, this not only makes a transformation toward provisioning systems based on the satisfaction of needs exceedingly difficult, but also suggests that an extreme reinforcement of appropriating (authoritarian) dynamics in provisioning systems could be more likely.

The struggle with the simultaneity of ideas for concrete measures toward transformation and the recognition of fundamental structural barriers that stakeholders and experts also experienced, thus, is not easily resolved. Many of the suggestions of the experts and stakeholders – shared key messages, building broad coalitions with social movements and trade unions, promoting step-by-step policy measures that provide social welfare, better communication from scientists – are well established in academic discussions on transformation (e.g., Brand 2016a; Gough 2019; O'Neill et al. 2018; Kreinin 2021). However, it is true that piecemeal transformations and social movements have so far not been able to challenge deep structural barriers to change. From a critical perspective, one may well argue that the most successful social movements for transformation have been absorbed into capitalist growth economies, with social movements providing "recreational experientialism" to help cope with the transition toward authoritarianism, rather than transformation (Blühdorn 2023).

Conclusion

This article identified key structural barriers to transforming provisioning systems into needs-based systems that enable 1.5° lifestyles and explored how these could be overcome, drawing on expert interviews and Stakeholder Thinking Labs in five EU countries. In pursuit of these objectives, we focused in particular on the four provisioning systems of food, mobility, housing, and leisure. The structures identified by the experts as the most powerful barriers to a transformation toward 1.5° lifestyles and provisioning systems included the economic growth paradigm, policy incoherence, the power of vested interests, the externalization of environmental costs, dominant narratives of the good life, inequalities, and the lack of integration of sustainability in educational curricula. Stakeholders' perspectives on how to achieve the necessary change highlighted the importance of focusing on welfare-provisioning, while improving its resource efficiency. They also

highlighted challenges related to participation and power (asymmetries) in governance.

Interviewees and lab participants identified the need to overcome a silo focus in policymaking in pursuit of sustainable provisioning, underlining the interaction and overlap between the key structures in and across provisioning systems. All four key provisioning systems – food, housing, mobility, and leisure – are affected by the same structural dynamics, failing to ensure needs-satisfaction at levels of resource use that are too high. For 1.5° lifestyles and sustainable provisioning systems to become manifest, a comprehensive transformation with concerted strategic measures at the system level is required, something that a change in the seven key structures does indeed imply.

Our study's methodological approach, while structured, also implies several limitations. First, despite efforts to diversify expertise, the predominant inclusion of academic experts in the interview process may have restricted the breadth of perspectives, including valuable insights from practitioners. Moreover, the subjective nature of expert selection does not lend itself to the generalization of the views expressed by the experts. The backcasting exercise, while valuable for envisioning alternative futures, may have been limited by participants' ability to articulate transformative changes, thus relying heavily on their creativity – our multidisciplinary approach (while being an asset) needed time for stakeholder alignment. The broad analysis employed in this article also hides differences between countries, so findings should not be universally applied. We also acknowledge the adaptation of the method to addressing country-specific needs and to understanding regional variations.

There is clearly a need for further research on how to bring about structural change in the pursuit of 1.5 °C-compatible provisioning systems. Such efforts may wish to zoom in on political strategies to bring about changes to structural barriers in provisioning systems in their specific local realities, especially as the impact of deep structures on provisioning systems depends on place, history, and culture, as pointed out by Gough (2019). While it is true that rent-seeking dynamics affect all European provisioning systems, it is important to acknowledge that they are affected differently (Schaffartzik et al. 2021; Bayliss and Fine 2020). Local contexts allow for the development of policy strategies for concrete interventions, and research in this area could explore local strategies to circumvent appropriating dynamics.

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Data availability statement

All data used is available on request.

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Appendix

Table A1. Twenty-two key barriers and enablers (Step 2 – Delphi ranking process).

	22 key barriers and enablers (not ranked) – the outcome of the Delphi-ranking process
A	Alternative narratives and measurements of (individual and collective) well-being and a good life (including notions of ideal home, good food, and so forth)
B	Citizen assemblies (to increase policy ambition, establish/prove social mandate, especially for lifestyle and consumption issues e.g., meat, cars, flights)
C	Economic growth paradigm institutionalized in social relations, political priorities, and valuations
D	Economic incentives/internalization of costs (eco-social taxation/subsidies, e.g., lower tax on labor, higher tax on emissions/energy use); (reliable regulation for) private investment in sustainable solutions
E	Efficiency focus – even though efficiency gains are outweighed by consumption increases on aggregate (Jevons' paradox/rebound effects at multiple levels)
F	Energy mix
G	Exclusion of relevant mobility sectors such as aviation and shipping from government emission calculations
H	Fear that high and rising energy demand may overburden systems relying on intermittent renewables
I	Inequity in resources, resource use, and power
J	Infrastructural lock-in effects (including centralization, lack of cycling lanes, rural public transport)
K	Integration of information and skills about sustainable lifestyles in school curricula and education
L	Lack of consistent, predictable, integrated policies; avoidance of bans/strong disincentives on extremely polluting goods/services (private jets/space travel, frequent flying, multiple home ownership, SUVs) and advertising; behavioral focus on lifestyle change
M	Lack of societal vision of a low-carbon society/post-materialist society
N	Lack of understanding of the severity of the environmental crises (incl. their interaction and social dimension)
O	Policies fostering the durability of products
P	Shifts in work-life balance (disruption of work-spend cycle; sustainability impact needs to be enabled by appropriate policy mix)
Q	Strongest institutionalization and consensual, concerted efforts from the global to the local level of governance yet
R	Sufficiency, justice. and limits-focused narratives/norms as basis for acceptance of strict environmental policies, fostering societal debate
S	Systematic influence of vested interests, incl. fossil-fuel incumbency (backed by powerful political actors/national geopolitical interests and underlying business models), retail corporations (especially in food sector), private media
T	Systems perspective on technological advances and transformation rather than fragmented policies/political institutions
U	Technological advances and existence of low-carbon technologies
V	Global competition (structured by unequal trade relations) obscuring consumption impacts in the Global South

Table A2. Overview of conducted expert interviews with interviewee profiles.

Interview ID	(Inter)national context	Gender	Position	Training/background	Core field of expertise
DE1	Germany	F	Academic	Social sciences	Urban development, housing policy
DE2	Germany	M	Academic	Social sciences	Mobility
DE3	Germany	F	Academic	Social sciences	Administrative studies
DE4	Germany	M	Academic	Natural sciences	Nutritional ecology, nutritional science
DE5	Germany	F	Practitioner	Social sciences	Fair trade, north-south inequalities
HU1	Hungary	M	Academic	Social sciences	Health sociology
HU2	Hungary	M	Academic	Natural sciences	Ecological economics
HU3	Hungary	F	Academic	Social sciences	Sustainable urban planning
HU4	Hungary	M	Practitioner	Natural sciences	Energy management
HU5	Hungary	M	Academic	Social sciences	Environmental economics
LV1	Latvia	M	Practitioner	Social sciences	Urban planning
LV2	Latvia	M	Practitioner	Social sciences	Urban planning
LV3	Latvia	F	Academic	Natural sciences	Environmental engineering
LV4	Latvia	F	Practitioner	Social sciences	Environmental governance, energy policy
LV5	Latvia	M	Practitioner	Social sciences	Sustainable tourism
LV6	Latvia	M	Academic	Social sciences	Sustainable food consumption
ES1	Spain	M	Practitioner	Social sciences	Circular economy
ES2	Spain	M	Academic	Social sciences	Sustainable urban planning
ES3	Spain	F	Practitioner	Social sciences	Waste management, agricultural waste
ES4	Spain	F	Practitioner	Natural sciences	Sustainable consumption
ES5	Spain	F	Practitioner	Social sciences	Sustainability consulting
SE1	Sweden	M	Academic	Social sciences	Sociology, sustainable consumption
SE2	Sweden	F	Academic	Social sciences	Sustainable consumption (housing)
SE3	Sweden	F	Academic	Social sciences	Sustainable consumption
SE4	Sweden	F	Practitioner	Natural sciences	Climate advocacy
SE5	Sweden	M	Academic	Social sciences	Human ecology
INT1	International	M	Academic	Social sciences	Political economy, development studies
INT2	International	F	Academic	Natural sciences	Global environmental studies
INT3	International	M	Academic	Social sciences	Sustainability and economic history
INT4	International	F	Academic	Social sciences	Sociology
INT5	International	F	Academic	Social sciences	Environmental sociology
INT6	International	M	Academic	Social sciences	Political economy, political sciences
INT7	International	M	Academic	Social sciences	Ecological economics
INT8	International	M	Academic	Social sciences	Law, anthropology
INT9	International	M	Academic	Social sciences	Transport policy, mobility
INT10	International	M	Academic	Natural sciences	Industrial ecology, physics

Table A3. – Interview guide.

	Interview questions: structural barriers & enablers
Ice-breaker (optionally choose one of these icebreakers, if you like, after introducing the project)	• Is there something associated with the 1.5° Lifestyles project, focus and goal, which is particularly interesting to you? • Could you briefly outline in which way you in your own work deal with the relationship between the role of structures and a transition to sustainable lifestyles?
Main Questions *(material: list of key barriers and enablers)* In this introductory part of the interview, we give the interviewee the chance to share their first impressions of our list of key structural barriers and enablers, against the background of their own country-specific expertise and professional experience.	(1). Which of the key barriers and enablers we identified in the literature review, do you think, are **most impactful**? (3-5) *Then, focus on (approx.) three of the structures named:* ° **Why** do you consider this structure to be so important? ° What would the **impact** of a change in this structure be? ° How could a change in the structure come about? What would you consider the most powerful **strategy to pursue such change**? (2). The number of relevant structures that can be named is nearly endless. But are there **barriers or enablers missing** that you deem of particular importance? ° Why do you consider that structure so important? What impact would a change in it have? How could such change be achieved?
Additional Questions *If there Is time, we would like to gather information on how interviewees stand on controversies that arose from the assessment of the literature and discussion in our consortium, in the second part of the interview. For this purpose, we developed some exemplary questions which the interviewers can use to follow-up on the main questions.* *They can be asked in general, but also applied to all four structural dimensions (economic, societal, technological, and political).* *Please select questions according to time available and appropriateness, according to the earlier responses or what you know about the expert in general.*	(1). To what extent is "a lack of knowledge (by whom?) about the severity of the crisis" a crucial problem in your view? The structures Identified as relevant in the literature range from more shallow, visible structures, which many be changed even by Individual actors, and deeper, less visible structures, which are difficult to change within existing power structures. (2). To what extent will addressing the shallower structural barriers allow us to achieve a transformation to 1.5° Lifestyles? (3). To what extent and how can we pursue change in the deeper structures? (4). What is the role of the individual consumer/voter/investor/politician in bringing about structural change? (5). What is the role of technology in the transformation toward 1.5° lifestyles? (6). Any other final thoughts or comments?
Follow-up	Offer social media post on a publication/project by the expert; Ask whether we can post about the expert's contribution to the project via the interview.

Table A4. Stakeholder thinking lab participants per category and case country (policymaking involved institutional policy makers, not politicians with publicity; businesses involved various forms and sizes).

Category	Number of participants	Country
Business	7	Germany
Experts and academia	2	Germany
Civil society	10	Germany
Policymaking	6	Germany
Media	2	Germany
Business	4	Hungary
Experts and academia	4	Hungary
Civil society	4	Hungary
Policymaking	6	Hungary
Media	3	Hungary
Business	5	Latvia
Experts and academia	2	Latvia
Civil society	5	Latvia
Policymaking	8	Latvia
Media	0	Latvia
Business	10	Spain
Experts and academia	3	Spain
Civil society	4	Spain
Policymaking	4	Spain
Media	1	Spain
Business	6	Sweden
Experts and academia	3	Sweden
Civil society	7	Sweden
Policymaking	6	Sweden
Media	1	Sweden