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RESEARCH ARTICLE

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The role of community sharing in sustainability transformation: case studies from Norway

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ABSTRACT

Based on three case studies of community sharing in different sectors of society, we address how and under what conditions community sharing can contribute to sustainability transformation. Considering modes of exchange an leverage points, we analyze how community sharing can add to transformation when sharing systems are designed to intervene at both shallow and deep leverage points. Our case studies indicate that sustainability transformations are dynamic processes in which even shallow levels of leverage can affect change. We show that community sharing can be upscaled through restructuring institutions via redistributive exchange systems, while initiatives supported by strong and lasting institutions are in the best position to contribute to change. Furthermore, our results suggest that sharing practices may strengthen ties and trust in an enterprise or local community. Finally, community-sharing systems that build on existing values in line with sustainability transformation may be in the best position to contribute to deeper levers of change.

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Sustainability transformation; leverage points; community sharing; institutionalization; redistributive exchange

Introduction

A fundamental transformation toward sustainability is increasingly recognized as necessary for achieving sustainable development goals (e.g., O'Brien 2012; Termeer et al. 2017). The Intergovernmental Panel on Climate Change (IPCC 2012) defines transformation as a fundamental qualitative change involving shifts in perception and meaning, changes in underlying norms and values, adjustments in power structures, and the introduction of new institutional arrangements and regulatory frameworks. This understanding of transformation forms the background for our study.

The sharing economy has gained attention as a potential driver of sustainability transformation, creating possibilities for more efficient use of goods and services and yielding environmental benefits, such as reductions in carbon-intensive transport or increased usage of underutilized assets (e.g., Aamaas and Andrew 2020; Mont et al. 2020). It may also have positive social and economic effects such as more social interaction between community members and opportunities for business development (Albinsson and Perera 2012; Sheth et al. 2011). However, there is also widespread concern that sharing through online marketplaces will contribute little to a sustainability transformation because of several adverse consequences, including the rebound effects stemming from the income gained by property owners who rent out their possessions and the reduced cost of mobility accessible via ride-sharing and lodging platforms (Barrios et al. 2019; Erhardt et al. 2019; Hawlitschek et al. 2018; Schor 2020; Schor and Vallas 2021).

In this article, we address how and under which conditions community sharing can contribute to sustainability transformation. We utilize a model of leverage points for sustainability transformation (Abson et al. 2017; Meadows 1999, 2008) as our framework for analyses. Abson et al. (2017) outline where interventions in a given system of interest may be made to provoke change and realms for which deep leverage for sustainability transformation may be achieved. The purpose of the present article is to produce empirically based knowledge relevant for understanding leverage-point dynamics. Following Abson et al. (2017), we refine our research problem and address two key themes, which are as follows: (1) the way different levels of leverage interact within different community-sharing

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schemes and (2) which factors drive transformation in these different systems.

Community sharing is considered one organizing form for sharing (Acquier et al. 2017). Sharing and the sharing economy are generally ambiguous notions with multiple definitions. The concept of *sharing* includes many different types of practices and covers different sectors and organizational forms (e.g., peer-to-peer sharing, business-to-peer sharing, for-profit and nonprofit sharing schemes; Acquier et al. 2017; Baumber et al. 2019). Acquier et al. (2017) argue that the sharing economy could be understood as an umbrella construct and rather than striving for an exact definition of sharing they argue that looking at sharing through its different organizational forms may contribute to sensemaking of the concept, illuminating different perspectives of sharing. Acquier et al. (2017) further suggest three foundational core components for the sharing economy that are as follows: (1) access economy, (2) platform economy, and (3) community-based economy.

We define community sharing as organized sharing activities that involve members of a well-defined societal group and where a centralized body provides an asset or a pool of assets and governs members' use.[1] Community sharing, of course, is not a new phenomenon. For instance, the municipal book library has been around for centuries and can be understood as an exemplar of community sharing. Other examples include community gardens and tool libraries. Similarly, the idea of sharing cars and bikes as a more environmentally friendly alternative to owning has a long history within anti-consumerism cultures in the Western world. Early forms of informal arrangements for sharing bikes and cars stretch back to the late 1940s in Switzerland, and in the following decades, multiple car-sharing cooperatives operated in most larger cities in Europe (Millard-Ball 2005; Shaheen and Cohen 2007). In 1970, the Dutch industrial engineer and visionary, Luud Schimmelpennink, even conducted experiments with shared electric cars to fight pollution in Amsterdam (the so-called "Witkar" experiments) (Ploeger and Oldenziel 2020).

Our investigation is based on three case studies of community sharing (car sharing, sharing in neighborhoods, and sharing of cabins) where a centralized body organizes the scheme and redistributes costs and benefits among its members. Our case studies represent local arenas where boundary-crossing relationships and trust can develop via both face-to-face meetings and digital interaction. Characterized by a mix of face-to-face and digital communication, such arenas can help build social capital, trust, and learning (Calzada and Cobo 2015; Larsen et al. 2008; Storper and Venables 2004).

From a sustainability perspective, forms of community sharing have been considered a promising alternative to market-based and reciprocity-based sharing schemes (Albinsson and Perera 2012; Hamari et al. 2016; Ozanne and Ballantine 2010, Svennevik et al. 2020). Compared with market-based schemes, community sharing may generate much lower rebound effects because individual consumers share costs but do not generate income. Moreover, in principle, access to goods may be nondiscriminatory in that membership is open to all (but still subject to governance or substantive inequalities that inhibit participation). Compared with reciprocity-based schemes, community sharing may be easier to scale up because the centralized entity may develop the financial and managerial capabilities required for larger schemes. Furthermore, such an entity may safeguard its mission and explicitly integrate sustainability goals next to the basic provisioning of access to particular goods or spaces (Avelino et al. 2019; Vaskelainen and Münzel 2018). In this way, community sharing may generate more general behavioral and social change among its users and beyond.

Despite the advantages of community sharing, studies have revealed challenges related to the sustainability effects of community-sharing initiatives. For instance, Bellotti et al. (2015) and Shih et al. (2015) studied time banks (multilateral service-barter networks of individuals) and found inconsistency between the ideological aspirations of founders and the lack of value these new institutions provided to members. Schor (2020) reported a similar finding from her team's study of a time bank, where the members had a strong ideological affinity to the mission, but many had limited use for the services, which reduced trading volume. In addition, some community-sharing efforts have been hampered by the exclusionary dynamics of class and race (Fitzmaurice and Schor 2019; Schor 2020). One lesson may be that, while more transformative efforts could have stronger potency to generate change, they can founder because of the required degree of deviation from established practices. We present three case studies – focusing on mobility, consumer goods, and leisure activities – in which we attempt to avoid some of these pitfalls by concentrating on the exchange of high-value items for all parties (cars, trailers, and cabins). Furthermore, the case studies were conducted in a context (Norway) with relatively small income inequalities between groups and where interpersonal trust is generally high (Andreasson 2017; Skirbekk and Grimen 2012).

Our contribution to the literature is both theoretical and empirical. Mont et al. (2020) make the

important point that the sustainability impacts of the sharing economy are not fully understood. Accordingly, we add empirical findings to the question of how we can comprehend and operationalize sustainability transformation in community sharing initiatives. Our study also provides deeper insight into the conclusions often found in the literature regarding the divide between incremental and transformational change (Termeer et al. 2017; O'Brien 2015; Nalau and Handmer 2015).

In the next section, we present the theory of leverage points (Abson et al. 2017; Meadows 1999) and explain how it relates to the three systems represented by our case studies of community sharing. We then introduce our three case studies and the methods we use. Our results are presented and discussed in the context of the theory of leverage points in the following sections. We conclude this article by reflecting on the theoretical and empirical implications of our results, including their possible policy implications.

Theoretical framework: leverage points for sustainability transformation

Environmental degradation such as biodiversity loss and impacts from climate change are major threats to humankind. Scientific assessments are increasingly insistent that humans need to reduce global emissions of greenhouse gases to near net-zero by ~2050 to avoid likely catastrophic consequences (IPCC 2018). Our entry point is that achieving a change of this scale and pace requires fundamental changes in the ways we organize our societies and our lifestyles. However, the form of the necessary interventions and the depth of our measures and policies remain contested (Few et al. 2017; O'Brien 2012; Termeer et al. 2017). Many argue that fundamental paradigmatic and radical overall changes of societal structures are needed, including our worldviews to achieve a sustainability transformation (e.g., O'Brien 2012). Others claim that both incremental changes in the contemporary societal system and abrupt system-wide events may lead to transformations (e.g., Few et al. 2017).

One promising way to understand transformation is through the lens of a *system perspective* (Liu et al. 2015). A major benefit of such an approach is that it helps avoid an "atomized" analysis focusing only on certain fields or parts without taking other parts of a system into consideration. Typically, single-view "techno-fix" approaches analyze the implications and effects of technologies and overlook social or institutional dimensions. System analysis has a long and diverse history in the social sciences (Bailey 1994; Walby 2007), but in the field of sustainability studies, a normative stance toward change has become prominent in recent years, raising questions about how systems can be changed. In a classic work, Meadows (1999) raised the question of how and in "what part of the system one should intervene" to cause changes. She outlined a hierarchy of *leverage points for sustainability* with different potentials for systemic change. A leverage point is a point of intervention in a system of interest to alter behaviors, trajectories, and outcomes, or as Meadows (1999) defined it, "a place in the system where a small change could lead to a large shift in behavior" (Meadows 2008, 145).

Meadows holds that interventions for change can take place on twelve different levels, from incremental adjustments to radical and paradigmatic reconfigurations. The transformational capacity of a given intervention depends on the characteristics of the system properties on which the intervention acts. Whereas some interventions are likely to trigger transformational change, others may cause minor changes in outcomes. In relation to community sharing, this is a relevant point of departure because it addresses how such initiatives can cause larger-scale changes in the system in which they are embedded and what strategies policymakers can utilize to further promote transformation.

Abson et al. (2017) grouped Meadows's twelve levers into four groups of interventions, from shallow to deep, as follows:

- Parameters (policy instruments, e.g., taxes and subsidies).
- Feedback (learning, interactions between elements in a system).
- Design (social structures and institutions that manage parameters and feedback).
- Intent (e.g., ideas, worldviews).

From a theoretical perspective, the leverage-point concept must be seen in relation to a specific type of socio-technical system (e.g., transport, leisure, housing). Although interest in systemic transformation has been growing in research on sustainability, most studies consider interventions at a shallow level (Dorninger et al. 2020; Gladkykh et al. 2018). Meadows (1999) also emphasized a lack of interventions targeting deeper points of leverage and the need for intervening on a deeper level. Abson et al. (2017) argue that it is possible that shallow leverage points shape and constrain deeper levels. Parameter adjustments (e.g., changes in taxations) or changes in feedback (e.g., increased understanding of the impacts of climate change) may influence the mindsets of actors, altering the emergent intent of a particular system over time. Overall, these authors

emphasize that there is a need for more knowledge on these issues: "An understanding of such potential interactions between deep and shallow leverage points represents a crucial gap in our current understanding of sustainability issues" (Abson et al. 2017, 36). In this article, we follow up on this call, shedding light on how shallow and deep leverage points interact. Relying on three case studies that explore interventions in the field of community sharing, we provide evidence of the interaction between leverage points and conditions influencing leverage points and the possible transformation within each system.

Abson et al. (2017) assert that leverage-point analysis offers three key pathways to achieving deep transformation: (1) *restructuring* institutions (Proust et al. 2012), (2) *reconnecting* people and nature, and (3) *rethinking* how knowledge is created and used (e.g., Horrigan 2019). The first pathway is the most relevant for the current project because our cases involve new institutional logics that, for example, switch from market to redistributional logic (e.g., shifting from owning a private car to participating in a car-sharing system offered through the employer). However, to some extent, we also address the pathways of reconnecting and rethinking through our third case study on cabin sharing. Here, we bring out new insights into factors that may trigger or sustain deeper levers for transformation, adding more understanding to conditions for sustainability transformation.

Case studies and methods

Case-study selection

This article synthesizes the results of three case studies of sharing in Norway, all part of a larger project on the sharing economy.[2] The examples address specific opportunities for change within three domains: transport (car sharing), neighborhood (household equipment), and leisure (cabin sharing).[3] We selected all of the case studies in collaboration with municipalities in the Oslo region.

Because community sharing was our focus, we limited possible case studies to local initiatives organized by a central entity. These examples cover different consumption domains with potentially large environmental impacts; they were chosen to ensure relevance regarding possible environmental consequences and to obtain variations in our case selection, enabling investigation of how the sustainability effects of sharing might vary across different systems. These cases are also well suited to providing evidence on systemic changes across different leverage points and in this way answer the research questions of this article.

We used calculations of the dominant consumption-based sources of greenhouse-gas emissions in Norway to guide our selection. Transport, housing (including relevant private consumption), food, and recreation stand out as the main consumption-based emission categories (Steen-Olsen et al. 2016). We included three of these consumption domains in this investigation.

Table 1 summarizes the case studies. All the case studies were conducted in Norway, a country with relatively low income inequality and high levels of interpersonal and institutional trust (Skirbekk and Grimen 2012). Hence, the transferability of the results to other contexts may be problematic. However, the case studies concern existing phenomena in many countries (car use, sharing between neighbors, and trekking) and cover consumption patterns of relevance to large groups of people. For instance, the neighborhood we investigated in the neighborhood-sharing study is a typical middle-class suburban community.

Methods and limitations

All of our case studies are qualitative, with data collection conducted via in-depth interviews with relevant actors (including households), content analyses of documents, and participatory observations were possible. We developed a common interview guide for the three case studies (adapted to the context), making it feasible to assess similarities and differences between the cases. Thus, our methodological strategy was to identify and explore theoretical concepts and mechanisms across different contexts (Eisenhardt 1989; Yin 2003). Our interviews focused on attitudes toward sharing, sharing practices and experience (including if and how they differed among family members), social networks, consumer habits, and values (specifically highlighting what the participants considered to be a good life). We also addressed the perceived benefits and challenges with the schemes. The (in-depth) interviews were conducted with sharers and organizers of the sharing schemes. The interviews were semi-structured,

Table 1. Overview of the case studies.

Case topic/number of interviews	Consumption systems	What is shared?	Organized by
Car sharing/21	Work and private transport	Hybrid and electric vehicles	County Council of Buskerud
Sharing in neighborhoods/25	Housing	Tools, trailer, community house, and information	Board of Djupdalen Resident Association
Cabin sharing/20	Recreation	Cabins	Norwegian Trekking Association

allowing respondents to discuss issues that were of interest to them.

We carried out 66 in-depth interviews (21 interviews for the case study on car sharing, 25 interviews for the case study on sharing in neighborhoods, and 20 interviews for the case study on cabin sharing; see Table 1). Respondents were recruited based on a purposive sampling strategy (Gobo 2004) to cover different types of sharers according to age, gender, and civil status. The research team took detailed notes during all observation work. In addition, we conducted content analyses of relevant material such as mission statements, guestbooks, and annual reports. In two of the case studies, small surveys were administered. In the sharing in the neighborhoods case study, 55 residents responded to the survey; in the cabin-sharing case study, 93 members of the Norwegian Trekking Association took part. The questions focused on sharing practices related to each scheme and their perceived benefits and challenges.

All interviews were recorded, and detailed notes covering the main topics were taken to facilitate the analyses. We analyzed all data sources qualitatively and grouped observations according to relevant topics. This process paid specific attention to allowing different voices and views to surface in our analyses to cover nuances in the answers. We followed the ethical guidelines for research set by the Norwegian Center for Research Data and anonymized interview data, insured secure storage of data, and obtained consent from all respondents for recording.

Interviews and observations are context-dependent, varying with the interview situation and the interviewer's subjective experience (Aléx and Hammarström 2008). Thus, reflections on each interview are important. Two or three researchers participated in each case study, allowing for these considerations to take place. Further, the multiple data sources incorporated into the study (i.e., interviews, observations, surveys, and content analyses of documents) may contribute to higher robustness of the results, allowing for examination of a phenomenon in different ways.

The project that this study is a part of relied on close collaboration between researchers and practitioners with the discussion of case-study design and results, and to some extent, direct participation by researchers in creating a system intervention (the sharing in neighborhood study). As such, this study bears similarities to collaborative action research, providing closer access to practices and social relations in the systems studied (Geirbo 2019; Mosse 2006). However, this approach might suffer from a tendency to overlook other perspectives than those of the practitioners and perhaps limit the possibilities to replicate the studies due to their context dependency (Aase and Fossåskaret 2014). Multiple data sources, as used in our study, may reduce the risks of these limitations.

Synopsis of each case study

Our three community sharing case studies are presented in detail below (see Table 1 for an overview).

Case 1: car sharing

The County Council of Buskerud (CCB) started a car-sharing scheme in 2017. Through collaboration with a commercial sharing company, a pool of electric vehicles (EVs) – and later hybrid EVs (HEVs) – was offered to 219 employees at the administrative headquarters building in Drammen. One car was later made available for teachers at a local high school and pedagogical support center. The organizers of the scheme informed employees that the cars were meant to be used to replace work trips formerly done using their private cars. In addition, outside of office hours, the vehicles were available, for an additional fee, to employees and nearby residents. Thus, this case involved both a technological (EV) and an organizational (car-sharing) component, representing a sociotechnical "package" intended to facilitate more sustainable and cost-efficient transport routines in the local community. The cars were accessible through the digital enterprise meeting calendar, and they could be booked in advance, much like a commercial reservation system.

We interviewed employees at the administrative headquarters, the local high school, and the pedagogical support center where the car-sharing system had been introduced. In addition, we carried out content analyses of documents relevant to the scheme, such as county council planning documents, minutes from meetings, and various websites.

Case 2: sharing in neighborhoods

This second case study deals with sharing in a suburban neighborhood near the city of Drammen (Westskog et al. 2020) and focuses on the factors that influence sharing practices in the area and the conditions for the upscaling of neighborhood sharing. The neighborhood is a middle-class locale consisting of 153 member households. The households are organized in a residents' association with the objective of insuring a good domestic milieu and providing practical tasks of interest to all residents (e.g., snow removal, maintenance of common

property including the community house). Membership is obligatory, and the households pay an annual fee.

Through collaboration between the researchers and the board, new sharing schemes in the neighborhood were established. A mapping of residents' views on what to be shared was conducted and a car trailer was the item most wanted. Hence, the residents' association purchased a car trailer to be shared by the neighbors; in addition, the community hall was made available for all residents for a small fee, and a Facebook group was established to facilitate sharing and conveying information from the board. In addition, the residents arranged events in the community hall, such as a clothing swap. We interviewed residents both before and after the introduction of these new schemes and this approach allowed us to explore the potential for increased sharing among residents and the conditions required for it to happen. Our data consist of a mapping survey among the residents, in-depth interviews with the member households and the board, and participant observation at sharing events.

Case 3: cabin sharing

The final case involves the Norwegian Trekking Association (DNT) that promotes "simple, active and nature-friendly outdoor activities and [strives] to safeguard the natural and cultural foundation for such activities" (DNT 2020a). This objective has guided the mission of the organization since 1868 when Thomas Heftye (the founder) expressed his ambition to make it "easy and cheap for many to come and see the largesse and beauty of our country" (DNT 2020b). Today, DNT has 300,000 members and offers cabins for use by members (and nonmembers for a higher fee) (DNT 2020c). Most of the organization's cabins are unstaffed and visitors are expected to sign in, report the number of nights stayed, and document the food eaten (for cabins outfitted with various supplies), and pay a requisite amount when they return home. Rules on how to behave when staying in the cabins are displayed on cabin walls and tables. The cabins are built and maintained based on voluntary work.

In the study, we collaborated with a local branch, DNT Ringerike, in the southeastern part of Norway (Westskog et al. 2021). This organization owns and operates nine unstaffed cabins for sharing in the surrounding area and seven of them were included in our study. It is possible to reserve the cabins in advance using an online booking system, but no other prior arrangements are necessary. One is guaranteed the opportunity to stay in the cabins regardless of a confirmed reservation. Without any staff present, the system relies entirely on trust; those who use the cabins are expected to exercise proper care, clean before departing, and make the facilities ready for the subsequent group of guests.

We conducted observations at all seven cabins included in this study, registering such practices as how the cabins were made ready for the next arrivals and reading entries in guest books and protocols. We also carried out interviews with guests at the cabins and with members of DNT Ringerike after the cabin visits. A digital survey was conducted among the DNT Ringerike members (see details above).

Results

In this article, we discuss how and under what conditions community sharing can contribute to sustainability transformation. We address both how different leverage points for sustainability transformation interact in the different case studies and the factors driving transformation within these systems. Below, we discuss the places of intervention in the system for the different case studies and the observed changes in practices and attitudes before demonstrating how the leverage points interact.

Places to intervene in the system and resulting changes

Car sharing

In the car-sharing case, the intervention addressed ways to conduct work trips more efficiently and with lower emissions, although with no strong intention of changing users' everyday car-based travel habits outside of work hours. This intervention took place at a shallow level, addressing parameter factors in the current system of transportation. The use of shared cars was mainly stimulated by utility-oriented motives, such as saving costs on fuel and parking space, and to some extent, implementing what was perceived as a greener alternative, expressed by one respondent as follows:

> There is an economic aspect, so it is nice to have a commercial company running the car, and it is both expensive and polluting to use private cars and then be reimbursed by the employer. (Car sharing, male, 30–40 years old)

Car sharing was also viewed as positive due to environmental reasons and a way to develop a "greener image" for the county council. Hence, the intervention was largely driven by potential benefits for the enterprise.

The organization benefited from the fact that the shared cars were fully booked and actively used during the day. It turned out that there were also positive outcomes for the employees, many of which

were unexpected. Most important for many employees was that they no longer needed to fill in reimbursement forms for business trips, which they often described as a hassle. Equally significant was that the use of shared cars reduced the "wear and tear" of their private cars, leading to reduced personal costs. There were also aspects related to convenience and practicalities because the employees could now choose among different car types. Thus, there were clear feedback-level mechanisms that strengthened implementation in the administration department.

After two years of rollout (2017–2019), the car-sharing facilities were gradually adopted in the enterprise. The policies implemented to restrict the use of private cars included a reduction of parking spots at the county council and general invitations to use shared cars when going to meetings. However, this was clearly not enough to make everyone stop using private cars during work hours. At the high school, a small number of teachers (∼4–5) used the cars to follow up with students outside the school and to attend administrative meetings in other parts of the region. Yet, there was expressed confusion about how and when to use the shared cars as well as who was to be reimbursed for the cost (i.e., the school or the administration). This lack of information caused frustration among the high school teachers and probably prevented further use. The use of shared cars outside of work hours was limited to employees and residents living in the neighborhood. However, none of the employees we talked to had used the carpool in their leisure time because it was considered too expensive or impractical.

The frequency of traveling to meetings for employees in other parts of the county was relatively high and multiple employees often attended the same events. In the new "travel-to-meeting system," co-riding to and from meetings became more common, giving new opportunities for informal talks. This arrangement clearly helped to use the cars more efficiently, and it made room for social conversation and (possibly) knowledge sharing.

> I like to co-ride with colleagues if I can, and the staff seem happy … Three hours alone with your boss is very, very nice, then you can clarify a lot of work-related issues. So, you become better acquainted. (Car sharing/manager, female, 40–50 years old)

Employees also expressed that they were less constrained in using their cars to travel to/from work on days when they had meetings outside the office. For some employees, the structure of travel activities and how they commuted to and from the workplace changed. When they did not have to use their private cars for work trips, commuting by public transport, biking, and walking became new options. This indicates that the intervention also involved changes at the *Design* level.

Neighborhood sharing

In this case, we addressed sharing organized by the board of the residents' association and sharing taking place reciprocally in the neighborhood. By responding to the rules of the exchange system (through redistribution), that is, *Design*, the intervention targeted a deeper level of the system. The respondents had mainly positive attitudes toward sharing. Their motivations for engaging in these practices were mainly based on practical and economic factors.

> Our sharing is motivated by economic considerations. (Neighborhood sharing, male, 60+ years old)

Some respondents also emphasized the norms of frugality and climate-friendly behavior. For others, sharing was also a missing element from "the old days," when they had just moved to the area with small children and routinely interacted more with their neighbors.

> We got to know each other as we were building [the houses]. Everybody had young kids who were running around and into each other's houses. There was a street party every Johnmas [Christian feast day celebrating the birth of John the Baptist], and we always had cakes available in case anyone dropped by. (Neighborhood sharing, female, 60+ years old)

To some extent, reciprocal sharing was already in place between residents of the neighborhood. It is noteworthy that the sharing schemes organized by the board led to more localized sharing and complemented the pre-existing reciprocal sharing. The trailer was used frequently (61 times during 15 months), and the community hall was used more often after the intervention according to our respondents. However, residents relied on the Facebook page mostly to convey information between the board and the households. Few items were shared using the digital platform and some interviewees expressed a concern that what one put on the page would be broadcast to the neighborhood. This concern might have deterred residents from using the page for sharing purposes.

Reciprocal sharing in the neighborhood has long been based on close relations and proximity and has relied on trust. Because the board organized sharing, more people participated in sharing independently of the close relations between those that shared. Many residents expressed a desire to increase their number of social activities. However, this was only

the outcome of the sharing schemes established by the board to a small extent. For instance, the board organized a swap day to increase the possibility for neighbors to socialize. However, few residents participated (only 10); despite expressing interest in more social interactions, many respondents reported that time was scarce and they had to prioritize other tasks. One woman commented,

> We haven't had a street party. I don't think it is so easy any more to get people to join social events. Everybody is so busy. (Neighborhood sharing, female, 50–60 years old)

The study illustrated that the conditions necessary to develop and sustain sharing systems vary with the exchange system; for example, sharing based on reciprocity requires close relations and trust among sharers, while redistributive sharing can take place without these elements. Hence, reciprocal and redistributive sharing systems can reinforce each other, expanding sharing to new groups and objects.

Sharing cabins

The original motivation of Thomas Heftye (the founder of the DNT in 1868) was to enable more people to enjoy nature, regardless of their social status or income. The system opened new ways of engaging in outdoor life and thus an intervention at the deeper *Design* level. Our respondents and survey respondents in the study of sharing cabins through the DNT expressed that their main motivations for using the system were enjoyment of nature, fresh air, and exercise, as well as to give experiences of nature to their children. Two individuals made the following comments:

> The motivation for going to a DNT cabin is to enjoy nature. (Cabin sharing, male, 30–40 years old)

> We usually hike from cabin to cabin, but we have done so less during the phase of having young children. Our youngest is now seven and it is time to resume longer hikes. It's important to me that the children learn to enjoy nature. (Cabin sharing, female, 30–40 years old)

Many respondents expressed that they wanted to use cabins more frequently but time constraints restricted more frequent use.

Visitors to the DNT cabins share the facilities with others who happen to be there at the same time. When using the cabins, certain rules are to be followed and familiarity with these codes of conduct facilitates their use. As shown by Westskog et al. (2021), it is not sufficient to read the rules; one must observe and learn how to behave at the cabins through face-to-face interactions because the written requirements diverge from actual and expected practices. Hence, the DNT system is embedded in a certain set of social and cultural structures, and the use of the cabins is facilitated by both formal and tacit knowledge. Many respondents own cabins, but they use the trekking association's facilities as an alternative place to spend their leisure time. Their familiarity with the codes of conduct at their private cabins facilitates effective and responsible use of DNT cabins.

Most guests behave according to the expectations and pay for their visit and food in a timely manner. However, newcomers – for instance those who are not familiar with the cultural norms – have recently put stress on the system in some parts of Norway. For instance, visitors from abroad have used the cabins without paying for their visits or contravened the rules (Westskog et al. 2021). One of the employees at DNT Ringerike expressed her concern in the following terms.

> Some of the mismatches that we now observe between income and expenditures might be due to an increase in the number of members, as well as that many of the new [members] do not relate to the culture of frugality and what that concept entails. People are not aware of how much work is involved in obtaining firewood and other work that is done at the cabins. Firewood is something you normally just buy. People use firewood, for instance, in a campfire tripod, and then they use a lot, not trying to conserve it. (Cabin sharing/manager, female, 30–40)

Our cabin-sharing study illustrates that a high level of trust is important for sustaining a system based on voluntary contributions and with no formal sanctions.

Leverage points dynamics

Car sharing

The shift from the use of private to shared cars at work was related to a company logic controlled and organized by the county government. Outside work hours, the employees had different needs, norms, and routines that made car-sharing much more challenging than it was in the context of work. They saw many practical barriers complicating a shift from privately owned cars to shared cars, especially related to the complexity of their everyday mobility patterns and poorly developed public transportation. The possibilities for transformation at the level of *Intent* were discussed but not seen as realistic. However, some respondents thought that sharing systems could allow their households to manage with only one car. What is more, many of them noted that there was a great deal of learning going on and that they had developed more positive

attitudes toward buying electric cars in the future, as one respondent commented,

> I had a steep learning curve when I was in Sarpsborg because I borrowed a car at the County House, one of those Kias, a small Kia that looked very attractive. But that kind of range on a motorway is a bit challenging, and I got to experience and learn something new about charging along motorways … It was an overnight gathering, so I got to use three different fast chargers … and it was totally new to me. I haven't had the need to use it [before], but it was useful. (Car sharing, female, 40–50 years old)

Some respondents viewed car sharing as positive for the environment, and many stated that they also tried to adopt greener practices in their households. Hence, the general idea of sharing as an acceptable alternative to owning may have been positively influenced by car-sharing at the workplace. The car-sharing intervention was initiated at a shallow level, addressing mechanisms to make work trips more efficient and to reduce emissions. However, during the trial, a transformation took hold that may have triggered changes at the *Feedback* and *Design* levels. This indicates that there was a diffusion mechanism involved when intervening at the shallow level of a system. Yet, the barriers to more disruptive change in the private mobility system are high, demanding significant changes in the larger system of car-based mobility.

Neighborhood sharing

The study of sharing in neighborhoods addressed a deeper level of leverage (*Design* level) toward sustainability transformation through establishing new sharing schemes via the board. Although some effects were experienced in the form of more sharing in the neighborhood, these sharing activities were mainly motivated by well-being (e.g., needing a trailer for own purposes). Further, when trying to recruit residents to contribute to renovating the community house, few participated. It was also difficult to engage residents in arranging social gatherings and parties. This indicates that, although intervening on a deeper transformative level, changes were superficial in practice and did not necessarily influence values and worldviews more deeply.

Sharing cabins

This study revealed that the users of the system share values and worldviews in line with a deeper level of transformation, for instance, by seeking experiences in nature or social interactions.

> Through DNT, you can get to know people you haven't met before. (Cabin sharing, male, 60+ years old)

We have identified the underlying values of the DNT system as frugality, equality, and trust; these are all values connected to the Norwegian concept of *friluftsliv* (literally outdoor life) (Reed and Rothenberg 1993; Anker 2020). In one of the cabins that we visited, a sign was found on the wall that read "Frugality is a virtue" (*Fønhuskoia*), and people expressed equally high satisfaction with both the modest and the more well-equipped cabins, as the following example of *Vikerkoia* (a very old and run-down cabin) confirms.

> *Vikerkoia* for the first time. It left a taste for more. Leaving today with that good feeling you have after a successful trip to a DNT cabin. We are sure to return soon. (Cabin sharing, guestbook, *Vikerkoia*)

The term *friluftsliv* implies "a philosophical lifestyle based on experiences of the freedom in nature and the spiritual connectedness with the landscape" (Gelter 2000, 78). Because of the extensive network, a large number of members, and the strong focus on values in line with sustainability, cabin sharing through the DNT have influenced leisure and holiday consumption in Norway toward a deeper transformative level over the years. At the same time, the system is challenged and has in recent years become integrated into mainstream consumption habits, where the trekking association's cabins are only used as a supplement to other types of leisure and holiday consumption.

Discussion

Meadows (1999) calls for interventions at deeper levels of leverage for sustainability transformation. Her argument is largely followed by Abson et al. (2017), although they also see a possibility that shallow leverage points may influence mindsets and intents of systems – that is, they may lead to deeper leverage. They also call for research that can bring more understanding to these issues. In this article, we have shed light on the dynamics between shallow and deep levels of leverage for sustainability transformation to analyze how community-sharing initiatives may contribute to such a shift.

The sharing initiatives that we studied all represent a redistributive mode of allocation (Polanyi 1957). The community-sharing systems are organized by nonprofit organizations and public entities outside the market. The three cases are all examples of recently established systems that provide opportunities for people to extend sharing practices to new areas and items. They reinforce existing sharing based on generalized reciprocity (sharing in neighborhoods), provide new arenas for sharing (car sharing), and may lead to new practices and more social interactions (all cases). Our case studies

Table 2 Summary of results.

	Car sharing	Sharing in neighborhoods	Sharing cabins
System	Transportation	Housing	Recreation
Intervention	Parameter level: enhancing enterprise objectives	Design level: intervention exploring alternative rules of consumption	Design level: intervention exploring alternative rules of recreation
Dynamics	Intervention at a shallow level; the sign of evolvement and interest in *Feedback* and *Design*	Limited use of the system in households; mainly used for utility-based needs	Well-established system that has contributed to transformation at the *Intent* level
Challenges	Hard to move beyond a work context	Triggers change only at shallow levels	Challenged by private consumption models
Conditions for transformation	Strong institution; joint learning	Organizing entity for sharing, face-to-face interactions, trust	Strong and long-lasting institution, face-to-face interactions, trust, shared values between organizer and users

confront standard market-based allocation systems by supporting new ways of organizing the consumption of goods and services and by encouraging sharing. In this way, the exchange is *restructured* by both sharing resources and introducing new institutions that can organize sharing.

We used Abson et al.'s (2017) leverage points for sustainability in the analyses. The results are summarized in Table 2 and illustrate that shallow levels of leverage for sustainability transformation can contribute to changes in deeper levers. For instance, the case study on car sharing organized through a county council shows that initiating change at a shallow level triggered changes at deeper levels of leverage (*Feedback* and *Design*). However, this outcome stands in contrast to the case study on sharing in neighborhoods, where addressing deeper levels of leverage (*Design*) resulted in more superficial changes in practice (not addressing values and worldviews). Hence, interventions at deeper leverage levels may also lead to changes on a more surface level. These results indicate that shallower levels of sustainability transformation could result in deeper system changes, as indicated by Abson et al. (2017). Further, it underpins Termeer et al.'s (2017) view that transformation toward sustainability must be seen as a continuous process and that incremental changes can also lead toward transformative change. Sustainability transformation is not a one-way change but a distributed and iterative process, where "small wins" can set in motion a cascade of further small changes through learning, inspiring, and legitimizing across actors and across domains (Termeer and Dewulf 2019).

Abson et al. (2017) point to three key pathways to achieve deep transformation. One of them is the *restructuring* of institutions, which is most relevant for our case studies that involved changes in institutional logics (e.g., change from market-based purchases to use of shared items organized by the board of a residents' association). Through the case studies, we also to some extent address the *reconnecting* of people and nature (cabin sharing) and *rethinking* (car sharing and cabin sharing) how knowledge is created and used. Our case studies reveal some of the factors that may trigger or sustain deeper levers for transformation.

In particular, the results from the cabin sharing case study give some insights into how deeper leverage could be obtained by addressing a system's values, worldviews, and goals. The DNT cabin-sharing system addresses values such as equality, trust, and frugality, which can be conceptualized as being in line with sustainability transformation and interventions at a deeper level of leverage. When it was established, the system was built on existing values in Norwegian society related to frugal outdoor life and a tradition of voluntary work. These underpinning values of the system have been maintained and still make up its foundation. In this way, a sharing system in which underlying values and attitudes that are important for sustainability have been successfully established. The system has not been considered too radical by the mainstream society to gain considerable support because it is based on values that already existed in the Norwegian outdoor tradition. Nevertheless, by maintaining these values, it has managed to challenge changes in outdoor-recreation practices and how humans *reconnect* with nature. What we observe in this case study is consistent with what we know from research on grassroots movements and their acceptance and upscaling in mainstream society. These movements must not be considered too radical by mainstream society to scale up; at the same time, they must have enough power to bring about change (Smith 2007). A pragmatic strategy for the development of a system is needed (Boyer 2015).

Our results are ambiguous. Not all cases resulted in changes in practices, attitudes, and values at a deeper level of leverage. Profound systemic changes entail reorganizing, learning, and adaptating (Abson et al. 2017; Gunderson and Holling 2002) and may require coordination and support by government, but coordination and support offered via a relatively responsive and modest role as opposed to being imposed in a top-down and planned fashion (Termeer et al. 2017; Termeer and Dewulf 2019).

This determination speaks to the study by Bernardi and Diamantini (2018) which shows how local governments can play a role as enabling actors in establishing sharing cities. They stress the importance of collaboration between private, public, and community actors in these processes. Ma et al. (2018) make the same point in their study of free-floating bike-sharing in Shanghai, arguing further that local governments need to accommodate and integrate private and community actors to nurture sustainable, efficient, and resilient sharing schemes in societies. Supporting Abson et al. (2017) and Gunderson and Holling (2002), both Bernardi and Diamantini (2018) and Ma et al. (2018) articulate a need for new governance models that engage society in transformative efforts.

Two of our case studies illustrate that the most successful sharing schemes studied here are those supported by strong and *lasting institutions* involving a regional public entity and a longstanding private nonprofit organization. Seyfang (2010, 7632) argued that the diffusion of sustainable practices indeed requires "certain political and social contexts to occur." In most cases, strong institutions are probably better situated to provide and demand the necessary instruments for change. These institutions may also play a crucial role as intermediaries facilitating learning across community-sharing initiatives, creating synergies and a stronger momentum for broader systemic changes (Hargreaves et al. 2013; Smith and Raven 2012).

A further reflection concerns the role of online platforms in community sharing. Our cases represent hybrid community-sharing systems combining newer forms of online interaction with older sharing based on face-to-face contacts. As documented in earlier studies, arenas for face-to-face interactions are important to increase learning and trust in communities and city-regions (Calzada and Cobo 2015; Larsen et al. 2008; Storper and Venables 2004). In the car-sharing case, most of the day-to-day learning took place through informal communication in the workplace, although help-desk services were available from the providers. Face-to-face interactions may also be essential for the transfer of the codes of conduct and underlying values of the DNT cabin system, forming communities of practice in which collective learning can take place (Wenger 1999). Further, reciprocal sharing in a neighborhood can be boosted by redistributive mechanisms, where social activities can be organized and social relations developed in decisive ways. Face-to-face encounters may facilitate trust-building relationships that enable close networks and reciprocal exchange.

Several aspects of our cases illustrate that *trust* and equality are important underlying values of the sharing systems. The system for sharing cabins, for instance, requires trust from its users; however, by signaling that guests are trusted, the DNT also invites confidence. Our study supports earlier findings that trust can facilitate sharing, while a lack of trust may be a barrier to sharing schemes and applications (Gao et al. 2017; Rosen et al. 2011). In contrast to the recent stream of market-based sharing systems, community-based sharing is usually related to a "thicker" form of trust based on reciprocity and shared values (Lessig 2008). In our study, this was particularly evident in the cases of neighborhood sharing and cabin sharing.

Finally, our cases show that to establish and maintain a practice interventions need a relatively low threshold for use. For instance, in the car-sharing case, the employees emphasized how the wider use of car-sharing depended on a well-functioning supportive public transport network and infrastructure for charging cars. The cabin-sharing case shows the importance of easy access. In this arrangement, no advance registration is necessary, all trails are well marked, and one "master key" opens all cabins. These findings are well in line with the results of other research. For instance, in a study of the car-sharing service MyWheels, Fraanje and Spaargaren (2019) demonstrate that immediate access to the car is important to allow for the possibility of ad hoc use.

Conclusion

A broad variety of conceptualizations can be found in the literature on societal transformation (Feola 2015, O'Brien 2012, Termeer et al 2017). Although a plurality of understandings may trigger discussions and further development of underlying ideas, as Feola (2015) argues, it may also have severe drawbacks, specifically in empirical research aiming at the implementation of measures and policies for change. Through Meadows's (1999) work and the later development of her perspectives by Abson et al. (2017), leverage points for sustainability transformations are identified, categorizing different interventions according to their ability to contribute to transformative change. This work partly responds to Feola's (2015) call for more research on transformations that are suitable for empirical testing. Using the framework by Abson et al. (2017) in our research provided the possibility to both deepen the insights on the possible transformative changes resulting from our case studies and widen the understanding of the processes of sustainability transformations. Thus, this framework has proven helpful in our empirically grounded research with the aim of contributing to understanding of how

and under which conditions community sharing can lead to sustainability transformation.

Through our case studies, we have shown that sustainability transformation is not a one-way change; rather, it is dynamic and iterative. Consistent with the notion of "small wins" in the study of system transformation, even shallow levers may trigger deeper levels of change (Termeer et al. 2017). Our studies also provide insight into conditions that may bring about and sustain deeper transformative change. First, community sharing arranged and supported by strong and lasting institutions is in the best position to contribute to change.

Second, face-to-face interactions may be key to facilitating trust and learning, and sharing practices may strengthen ties and trust in an enterprise or a local community. These results are well aligned with research on factors facilitating sustainable development in communities and cities in general (e.g., Seyfang 2010, Storper and Venables 2004), but underline the importance of these conditions as drivers for sustainability transformations.

Finally, as illustrated by the case study on cabin sharing, community-sharing systems that build on underlying mainstream social values that are in line with sustainability transformation for a deeper level of leverage, may be in the best position to contribute to change. As Smith (2007) points out, initiatives that are not too radical in comparison to practices that are generally considered acceptable by mainstream society and at the same time powerful enough to bring change, are those with the highest potential to contribute to sustainability. This is well illustrated in the cabin-sharing case study.

These results point to some indicative policy recommendations. Municipalities, housing associations, and nonprofit organizations can play a role in developing sharing through redistribution. This way of structuring exchange provides an alternative to market-based logic founded on self-interest and profit maximization and reinforces the importance of the argument by Abson et al. (2017) that institutions play a crucial role in sustainability transformation (the need for *restructuring*). In addition, providing the possibility of face-to-face interactions through community sharing is key for learning, trust-building, and network-building – all factors that may lead to changes in deeper levers of sustainability transformation.

We close by noting that our case studies were conducted in Norway under quite homogenous conditions in terms of culture, ethnicity, and social groups. Similar conditions are found in Nordic and several other European countries, which may make our results relevant in these contexts. However, more research is needed to assess whether our findings are valid in other environments. Finally, as Jochumsen (2012) notes, we need to understand how existing institutions, such as libraries, can contribute to sustainability transformation by supporting community sharing and helping to create synergies and learning across community-sharing initiatives.

Notes

1. Polanyi (1957) distinguishes three modes of allocation outside the household – market exchange, reciprocity, and redistribution. Our case studies of community sharing are redistributive in nature. A centralized body organizes the sharing schemes.
2. The overall aim of this research project was to understand motivations for participating in, attitudes toward, and experiences with different community-sharing schemes. We also addressed the possible consequences for sustainability of the different sharing schemes. The case studies included in the project were car sharing, sharing in neighborhoods, community-supported agriculture, and cabin sharing. Each case study is an independent study analyzed and presented in separate papers.
3. In this article, we have chosen to include only three of four cases from the original project to be able to provide sufficient detail about each case.

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