

Thinking with co-creation: meaningful engagement and regeneration in deeper adaptation to climate change

Abstract

Whether we regard the 1.5 °C target as feasible, climate change adaptation can bring the most favourable outcomes when supported by strategies that increase democratic participation while embracing diverse perspectives and worldviews that highlight the potential for societal change. Rooted in values of equity, justice, mutual aid, creativity and compassion, flexible co-creation approaches show promise in accommodating more caring conversations and actions. In this article, we share insights on factors shaping engagement quality in co-creative adaptation across different cultural contexts. We identify common characteristics that support high levels of engagement, deeper care and meaningful participation over time. These include 1) 'arts of noticing', 2) strengthening community networks and 3) cultural and social-ecological reproduction and restoration. These modes of engagement can provide nuance in the conversation on care and deep adaptation with ways to meaningfully navigate the social-ecological crisis on an increasingly damaged planet.

Keywords

Co-creativity • deep(er) adaptation • revitalization • building resilience • cities • neighbourhoods

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Introduction

The impacts of climate change are being felt worldwide, including the increased risk of catastrophic weather events (Bouwer 2019), contributing to growing societal unrest. Therefore, there is a pressing need to find new paths for life and development that are adaptable to uncertain and turbulent times. These pathways need to be resilient to withstand increased social-ecological pressures, and flexible to accommodate the need for deep-rooted change and course correction. This is sometimes referred to as 'deep adaptation', a concept articulated by sustainability researcher Jem Bendell (2018).

The initial scholarship on deep adaptation focused on the possibility that global society may not be able to avoid a climate catastrophe. It searched for ways of dealing with the fear and grief associated with the catastrophe's impact and navigating the global aftermath. This scholarship argues for the inevitability of the apocalypse, which necessitates preparedness for a post-apocalyptic world (de Moor 2021). This logic is accompanied by a shift in the understanding of the potential for adaptation. While important, focusing on the post-apocalypse risks losing sight of the many possible shifts and transformations within an ongoing climate disaster. The deep adaptation scholarship has

begun to examine the potential for community-building within this process – what Bendell (2023) has termed 'breaking together'. This aligns with certain perspectives from within contemporary post-humanist and ecofeminist scholarship that centres on not only becoming, as opposed to a static understanding of being, but of becoming with, or 'making kin' (Haraway 2015). Here, exploring multi-species entanglements is encouraged. With such perspectives, adaptation involves engaging with an unruly transformative process rather than managing a well-defined transition, or a specified political goal.

This article aims to complement the discussion on deep adaptation pathways by analysing the role and importance of co-creation in a sustainable and just climate change adaptation process. This has been based on part of an international research project named "Co-Adapt: Communities for Climate Change Action". For this project, we reviewed the literature on co-creation methods for transformative adaptation and examined examples of highly motivated communities that have made substantial advances in climate change adaptation due to their specific transformative capacities. The project also included ethnographic fieldwork, including participant observation and semi-structured interviews in Norway, Spain, Poland and the US. Drawing on this

research, we highlight the need to identify and support creative and flexible modes of adaptation that encourage imaginative, critical, and egalitarian social engagement. Such an engagement may inform the dynamic between what we must let go of and what could be transformed or built amidst a world in crisis.

We start with a short section on the state of the art on modes of resilience and co-creation before analyzing case studies that exemplify a more transformative approach to adaptation through co-creation. We have synthesized results from ethnographic research conducted in an eco village in Norway, in the ecovillage of Twin Oaks in the USA, the town of Vitoria-Gasteiz in Spain, and allotment gardens in Nowa Huta in Poland. We have structured the discussion by contrasting and integrating the findings on climate change adaptation, which can strengthen the transformative potential of adaptation actions in the face of climate chaos. The premise is an assumed untapped potential for co-creation within the adaptation realm. We have also explored pathways for deep or transformative change. This builds on scholarship about transformations, crises, and the problems of addressing the decreasing liveability on Earth, including the notions of liminality to represent the ways climate change generates betwixt-and-between states of being (Gavriliuță et al. 2023). In this context, we are referring to deep change or deeper adaptation that aims to go further than simple and isolated actions or measures and instead takes a more holistic approach to the intersections of the climate change crisis for a sustainable and just futures. Taken together, we have explored pathways that can strengthen liveability amidst disruptive and challenging times.

From adaptation to deep adaptation, transformation and community resilience

Societies are becoming increasingly aware of a range of negative climate-related phenomena, such as floods, hurricanes and heatwaves (Lloyd et al. 2020), which have a measurable impact on public health and the economy. They are also noticing less dynamic changes, such as a lack of snow in winter, rising food prices and lakes drying up in the summer. As climate change is becoming more real to more people, the need for adaptation is increasingly on the political agenda of local and national governments. The term 'adaptation' is commonly understood to mean the process of counteracting (Carter et al. 2015) and adjusting to actual or expected climate change and its impacts to reduce damage or take advantage of opportunities (IPCC 2022). Mostly carried out by public administrations, these activities primarily focus on infrastructure and technical interventions. However, with the increased awareness of climate change, adaptation has become increasingly scrutinized and recognized as a highly politicized field. Rather than something exclusively technical, adaptation is understood to also imply a host of ethical questions, such as who is to adapt, to what and how? Adaptation interventions have often been criticized for exacerbating unjust or maladaptive impacts by overlooking their social, economic, and environmental implications (Eriksen et al. 2021), resulting in unforeseen and unanticipated adverse consequences (Hughes 2020). This has made both researchers and political activists call for more transformative adaptation. However, if we assume that a successful adaptation implies a more fundamental change, or indeed a transformation, it may be counter-productive to rely solely on official formal structures and the state for such efforts. What happens on the periphery of the state often evades or resists the nexus of modernist state-making, although it is often encompassed by the nation-state and informed by logics of globalism, imperialism, neo-coloniality and upholding the status quo (Figueroa Helland et al. 2016).

In the social sciences, climate change adaptation is often explored in the context of resilience theory. Resilience denotes

the ability of a given system to return to system stability or to respond and reorganize, because of a negative stimulus/event (da Silva et al. 2012). Resilience thinking offers a useful lens to explore and understand the complex dynamics of human interactions and changing human-nature relationships (Folke et al. 2010). Transformation, that is, the capacity to move a system into new development trajectories when the current trajectory becomes undesirable or untenable, is a central part of resilience and deeper adaptation pathways. Following the idea of adaptive cycles, transformability may play out in the so-called release and re-organization phases when a system regime is faced with disruption and must change.

Forced into being by outer factors or deliberately initiated, transformational phases can be connected to the idea of liminal phases. Here, crises become windows of opportunity for novelty, new ways of combining and applying knowledge and navigating transitions in social-ecological systems. Liminal space and time can emerge during and after events, phases or processes that are disastrous, such as large floods or, at a larger scale, climate change, with its complex workings, effects and consequences. Climate change is a type of liminal event that highlights underlying or overarching hierarchies and issues. It flips things on their head and makes ground and water unstable. The liminal disrupted plethora of nature:human entanglements create new forms of relational and social categories and linkages that may transform life. The phenomena of liminal events, especially those that lead to suffering, can lead to action imbued with collective solidarity and a shared feeling of togetherness among those affected (Gavriliuță et al. 2023).

According to resilience theory, a multitude of local small-scale transformations increase resilience at a larger scale (Folke et al. 2010). Within the debates on 'deep adaptation', the processes of adaptation and resilience building are insufficient in the face of the expected impacts of climate change, and resilience becomes highlighted as part of the liminal phase. Besides human community resilience and the ability to adapt, 'deep adaptation' also focuses on renunciation, accepting that we must give up some of our consumption habits and behaviours, as well as revitalization (restoration). This allows us to build a new reality aligned with adaptation to these changes (Bendell 2018). This is part of bigger transformational shifts that may happen alongside climate change.

Within certain social movements and critical social science scholarship, there is a growing sense that climate change resilience will occur as bottom-up responses by local communities and social networks rather than from top-down investments in physical infrastructure (Aldrich 2017). Liminal phases of crises put human creativity at the forefront. As we see in many cases, they can upheave and transform states of being (Gavriliuță et al. 2023). In turn, the phantasmatic term of 'collapsology' can deter insight into the transformative happenings of crises. By transformational, we mean that the changes that occur do not only fundamentally alter the logic, structures and relations within society but do so in ways that create new modes of liveability. The sometimes-veiled forms of resistance and resilience within collapse and crisis – the traces of life in death – can be regenerative, deconstructive and experimental.

From top-down adaptation to co-creative practices

Co-creative practices can play an important role in meaningful, just and effective participation in climate change adaptation (Braga 2021). Co-creation can refer to a plethora of different processes and contexts, where stakeholders collaborate to generate knowledge and solutions (Mauser et al. 2013). Such collaboration involves defining a shared framework and engaging in joint knowledge production. Co-produced outcomes play

Table 1. An overview of the selected case studies

Study area	Community size	Data sources	Study duration
Twin Oaks, USA	Ca. 100 members	Anthropological fieldwork including participant observation and semi-structured and in-depth interviews with 20 members	November 2015–January 2017, and May 2022
Bøl Bergen Eco-Village, Osterøy, Norway	39 units in planning	Semi-structured interviews	June 2022
Vitoria-Gasteiz, Spain	Ca. 100 community activists involved in the community projects	Two weeks of ethnographic fieldwork with participant observation, semi-structured and in-depth interviews with three key informants	August 2022
Nowa Huta, Poland	Currently maximum a hundred living first, eldest gardeners, I spoke to a few dozen of them; under socialism a community of a few thousand gardeners in Nowa Huta	12-month ethnographic fieldwork: epistemic partnership, participant observation and in-depth interviews	April–September 2022 and May–October 2023, sporadically summer 2024

Source: own elaboration

a vital role in helping local communities tackle crucial issues and overcome adaptive planning obstacles. In climate change adaptation, well-designed co-creation processes can yield numerous benefits. These include facilitating social learning, enhancing knowledge and motivation, acknowledging various stakeholders and planning levels, fostering interdisciplinary collaboration and co-creation skills and embracing landscape-based systemic thinking (Galan et al. 2023). While there is consensus regarding the importance of co-creation processes in climate change adaptation, most adaptation initiatives have been characterized by top-down approaches. To limit the scope of the discussion, we have focused on co-creation cases where the act of co-creation falls not on the set dyadic (ex-top-down) adaptation frameworks and systems but within more dynamic, complex and emergent processes. Here, challenges are identified and responded to through actual creation, rather than, for example, only providing systematic responses via public administration.

The growing awareness within critical social science scholarship of the negative social impacts of some climate change adaptation interventions (e.g., Eriksen et al. 2021), has brought questions of justice and equity, as well as other drivers of vulnerability to the forefront of adaptation theorization (Ziervogel et al. 2021). It is crucial that those planning and implementing intervention understand specific contextual nuances and factors of adaptation, such as gender, race, age, (dis)ability and socioeconomic position. Failure to do so has been identified as a primary cause of maladaptive outcomes (Eriksen et al. 2021).

Schipper (2020) highlights that external actors, who may lack a profound understanding of the local contexts in which they operate, often increase the vulnerability of affected communities by inadequate design and execution of planned adaptation strategies. Generic solutions may not align with the needs of local communities, failing to deliver the desired results. In contrast, bottom-up strategies, where decision-making is decentralized and taken up by those who need and benefit from adaptation, potentially have higher chances of effective and sustainable outcomes. Nonetheless, these strategies can be difficult to implement. Limited information can lead to suboptimal decisions. Additionally, there can be inadequate support networks and insufficient capacity to pursue alternative livelihoods or sustain adaptation measures (Schipper 2020).

To achieve a more transformative and equitable urban adaptation, a concerted focus on equality is imperative across all stages of adaptation planning, implementation and monitoring. One promising approach to reducing vulnerability involves restructuring the dynamics between adaptation practitioners and local populations engaged in adaptation interventions (Eriksen et al. 2021). Cultivating genuine partnerships that value and leverage local knowledge and expertise is essential. Integrating socioeconomic factors into adaptation planning can offer more in-depth insights into the vulnerabilities and capacities of different social groups, facilitating the development of impactful adaptation strategies (Prall et al. 2023).

Below, we have examined three modes of transformative co-creation that can address some of the shortcomings of top-down adaptation efforts and, by comparing fieldwork findings, have shown how co-creativity can lead to deeper adaptation.

Three transformative co-creation modes

The following reflections are derived from our research in Norway, Spain, Poland and the US over the past decade. The data has been selected and revisited, and some new fieldwork has been conducted to inform the co-production lab design in the project Co-Adapt due to these communities' specific pathways to deeper adaptation. We have drawn on these studies here, not as independent analyses, but to help exemplify the modes that we have identified through comparison of action, meaning and narratives amongst the communities and informants. The key information on these case studies has been summarized in Table 1.

'Arts of noticing' and more egalitarian nature: human: more-than-human relationships

In our research, we have worked with numerous individuals who have a deep connection to their natural surroundings or are trying to find new ways of living within nature and are thus capable of 'noticing'. Drawing on the work of Anna Tsing (2015) and others, 'noticing' refers to activities that encourage spending time learning about, observing or moving in nature, allowing for the growth of knowledge and connection. Through our work, we see local leaders, activists, amateur scientists, historians and other key community figures play the roles of gatekeepers to local knowledge and findings on the shifts and intricacies of

climate change. They are 'noticing' nature and relations within in conscientious ways. This allows them to gain a greater understanding of various interconnections and functions of life and how they change with the climate, and the risks and issues that this process could entail. This is an activity that opens a multiplicity of knowledge of the interconnections of life worlds, teaching us to be attentive to different ways of life (van Dooren et al. 2016). Finding new methods and tools we can use to learn to notice is important for gaining a new understanding of the rapid changes that are happening around us.

Fieldwork reflections

At Twin Oaks, USA, eco-villagers share the collective endeavour of coping with climate change by developing egalitarian political structures. They notice and question aspects of everyday life and experiment with more than just ways of being and adapt rapidly to changes due to their egalitarian and flexible structure. At Twin Oaks, a citizen researcher claimed that their involvement with nature around them, which focused especially on observing mushrooms, made them feel a greater understanding of themselves as a part of nature and that they 'can hold as much diversity in them as the nature around them'. These ways of noticing nature have inspired this researcher to take an active part in knowledge production on regional climate change and reports on biodiversity changes due to climate changes, alongside the government. This also fosters attention to multi-species entanglements. Similarly, in an ecovillage in Bergen, Norway, our informants practice new ways of being through noticing. They believe that politicians and politics became too distant from people's lives, and positive efforts made by either civic society or the government are often countered by rebound effects or destructive actions, including changes in land use. One informant described climate change action as 'peace-work', 'peace with ourselves, the Earth and the future'. She believes that people have lost touch with the Earth and that they should be invited in to 'see nature' together, such as by picking berries together or playing in nature. Similarly, in a sister-project to Co-Adapt, an Urban Living Lab project in Poland, called Smartfood, we introduced hydroponic growing solutions of edible plants into an apartment building. This increases food safety and resiliency in urban areas which is of critical importance under climate change. The project participants selected and grew plants, through which they learned more about food cultivation. This made them proud to see the progress of plant growth, and raised their awareness of the future risks and opportunities urban food systems may face. Participants expressed awe over how easy and fun it was to grow edible plants and felt a newfound ownership of common spaces which inspired social encounters and connections. Arts of noticing are artful and sometimes playful interactions that deepen the understanding of and entanglement with the environment which, in turn, encourages adaptability. However, such ways of practicing adaptation are often overlooked.

Strengthening community networks

Recent social science research highlights the importance of communities as key actors in adaptation efforts and finds that community resilience enables successful adaptation. Formal and informal community networks are essential in this context because they form a scaffolding for coping with rapid climate change (Wamsler et al. 2018). Some scholars have connected resiliency to liminality in periods of crisis (Jencson 2001). Liminal qualities of disasters can highlight social structures that are already at work while also creating a new sociality which emerges from spontaneous solidarity (Korsbrekke 2013). Thinking

about social processes and liminality in times of climate change can offer insights into how people create new modes of life amid an existential crisis.

Fieldwork reflections

Intentional communities and eco-villages such as Twin Oaks rally during times of crisis. This can build on the flexibility that liminal periods introduce to encourage systematic change. Shared solidarity and community values engender creative mutual aid and adaptation initiatives. Direct democratic and egalitarian structure and the rotational leadership positions of Twin Oaks ensures that the community can be flexible and experimental during such liminal periods. For instance, its members rapidly shift their priorities in labour budgets or introduce new social norms (Korsbrekke 2021). The informal landscapes which create most resilience networks during emergencies and crises are often either not visible for the official institutions or they function at the periphery of the state. They are mainly created by people who respond to crises through mutual aid, collaboration and sharing to rebuild their homes and communities – not because they are mandated to, but because where they live is closely connected to their identity and social networks. They form resilient networks, which are based on the knowledge of their surroundings and their human and non-human history and can organize wisely when they face a major crisis. Similarly, the Vitoria-Gasteiz municipality in Spain has a long tradition of engaging with sustainability and environmental issues, especially green and blue infrastructure. Here, community groups initiate projects that introduce new greenery, some of which are co-produced with the city administration. One example is a previously vacant area in the Lakua neighbourhood with an untidy appearance and shallow topsoil which was turned into a 9000 m² horticultural garden. The project received technical and financial support from the city administration because the initiative was closely aligned with its objectives. According to the community members involved, the horticultural garden and edible forest projects only succeeded because of the neighbours who had already previously organized themselves and worked together to establish a community garden in the area. Informants from citizen organizations in Vitoria-Gasteiz are clear that collaboration between the community groups and the city administration functions best when the initiative comes from the citizens. In this context, community groups feel a greater ownership and freedom to design and maintain the project, than if they had joined the project with it already having a predefined plan. For the city administration, then becomes easier to build on existing initiatives and engagement. However, city administration–citizen collaborations are not always straightforward although they share objectives. The community organizers expressed that they were 'creating community' by collectively learning about nature and ecology, co-creation, physical work and social cohesion.

Cultural and social-ecological reproduction and restoration

Successful climate change adaptation requires a radical transformation of societal systems and structures, including economic ones. Yet, while we subscribe to this view, we also have been struck by the importance of the slow and steady reproduction and restoration of cultural and social-ecological assets. At the community level, resilience is rooted in an endeavour for continuity in time of what we care about – of ourselves, our families, communities and ways of life, relations, cultures and ecologies. The tools communities use mostly derive from their everyday practices, past experiences, shared knowledge and cultures that evolve and change over time.

Fieldwork reflections

The importance of reproduction and restoration for adaptation is salient among the elderly gardeners from the allotments in Nowa Huta, a district of Kraków in Poland. Nowa Huta was built after the WWII as an ideal, socialist working-class company town of the Lenin Steelworks. The first inhabitants of Nowa Huta came from the countryside, where they grew up during the turbulent times of WWII and early post-war years. As children, they experienced shortages, poverty and hunger, which their families and communities coped with through rural subsistence agriculture and moral economy (Scott 1976). Under state socialism, local workplaces founded thirty allotment gardens in the district for their workers. The allotments helped the first gardeners adapt from the peasants' life in the countryside to the workers' life in the city. This enabled continuation of rural ethics, practices and relations. Before or after waged labour, the gardeners went to the allotments to grow vegetables and fruit, breed animals and build garden sheds. Using local knowledge and social ties, they found, gained or exchanged the materials and seeds they needed. They rarely bought anything and instead cultivated their own food, made, fixed and repaired stuff themselves. The community was close-knit and characterized by neighbourly relations, mutual help and working together for the common good. These communal values and practices helped the gardeners cope with economic crises such as the shortage economy under state socialism, social transformations such as the post-socialist transition, life changes such as retirement, ageing and facing death and global shifts such as globalization and climate change. They managed to survive and thrive in times of hardships, transformations and crises. Their radical gardening, recycling subsistence culture and moral economy is ecologically sustainable and is an example of how to put food sovereignty and degrowth into practice. The motivation behind their work was not primarily environmental but personal, social, economic or even cosmological – the reproduction of their families, passing down their knowledge and ensuring the continuity of life into the future. They found an existential meaning of their lives through participation in reproduction and repair of life on Earth.

Discussion: transformative engagement and care in adaptation

Social movements and community movements such as the ones explored here can provide alternative, bottom-up solutions to address unsustainable practices and vulnerabilities (Stirling 2014), by providing plural understandings and multiple pathways towards sustainability (Arora, 2019). Rather than (highly) modernist approaches that seek to level epistemological and cultural hierarchies, the engagements we have explored above strive to apply more 'caring practices' (Stirling 2019). In a similar vein, Arora (2019) outlines four bases for a transformative engagement which supports multiple perspectives I: (a) egalitarian commitment to distributing epistemological privilege; (b) ontological sensitivity – valuing the relational bases of others' knowledge-making; (c) learning for divergence from others – recognizing marginalized knowledge and groups; and (d) 'affinity in alterity across widening divergence' in which practitioners resist treating knowledge hierarchically (Arora 2019, p. 1580).

These empirical examples show some of the power and nuance emerging within co-creative processes and open the discussion surrounding ways to enable and support a more transformative and 'deep' climate change adaptation. This can be achieved through deliberate engagement based on egalitarianism, respect and sensitive approaches to ontologies, learning divergence and finding affinity. What they have in

common is that they are community-driven and embedded within a particular relational logic. Because co-production, when operating within the above principles, includes multiple voices, human and non-human agents, cultures and perspectives, it raises questions of epistemological and ontological complexities. Unpacking and paying greater attention to the dynamics between different ontologies and relationships and how we as researchers approach ontological differences can reveal aspects of environmental governance that would otherwise remain hidden, allowing us to open unexplored co-productive pathways to sustainable adaptation.

This has implications for those of us who identify as adaptation and resilience research practitioners. These unexplored pathways invite us to, firstly, act against environmental inequalities, secondly, keep in mind the interconnectedness of social, political and environmental crises, and finally, learn from the communities which are experienced in and knowledgeable about adaptation and resilience within their context. Transferring adaptation solutions from the Global North to the Global South or from affluent upper- and middle-class to income-poor working-class neighbourhoods risks perpetuating colonial or classist assumptions and often proves unsuccessful. Therefore, the tools, methods and solutions that communities put to use are per definition more available and sustainable because they are based on their work rather than large financial sources or support from strong formal structures.

The modes of co-creative and deeper adaptation that we explored have been exemplified by cases where such care is practised in various ways. While they have functioned well, there are reasons to also focus on what the communities might be missing to support successful climate change adaptation or to look at these modes as potential steps towards deeper adaptation. The findings highlight the need for an increased focus on cultures, ethics networks and practices that already exist or existed in the past which are sustainable, and which can help communities adapt and build resilience.

Conclusions: principles for co-creative adaptation

The phenomenon of climate catastrophe, which intensifies annually, poses a sometimes existential threat to people worldwide. Conventional conservation measures, in the form of adaptation of urban spaces to climate change, are implemented too slowly and inadequately, often in ways that do not consider issues of social justice. The effectiveness of these measures depends on a broader understanding of climate change impacts and adaptation. The systemic so-called 'mainstream' approach to adaptation, which involves identifying a specific threat posed by a disaster, and implementing targeted solutions, restricts us to a limited view of the holistic spectrum of crisis threats and potential pathways for defence or engagement. Therefore, there is a need for paradigm shifts in this discourse – from adaptation, that is, being prepared for the arrival of a disaster, to deep adaptation, namely, being prepared for life not only after a disaster but also amidst continual disaster.

In this study, we have pointed to knowledge gaps regarding how to address ontological and epistemological variability. We have provided examples of the complexities arising from co-production in adaptation as a strong illustration of how to prepare for 'deep adaptation'. From this we can draw several conclusions:

1) Climate change challenges community relationships and functioning. When confronting so-called 'ominous problems', the situation demands complex responses. Oversimplifications in favour of management or efficiency can, in some cases, lead to maladaptation and marginalization – not only of people but also of lives, narratives, discourses, perspectives and processes of adaptive creativity.

2) While deeper transformative adaptive behaviour is

developing, it does not show the necessary speed or scale. Our in-depth interviews and ethnographic observations indicate that:

(a) Some communities have discovered viable pathways toward adaptive change, but it requires organizational efforts and a creative approach to implement. They use tools that derive from their daily practices, experiences, common knowledge and culture – they possess the capacity for continuous evaluation and change over time as seen in the Nowa Huta community and at Twin Oaks.

(b) Adaptation activities also occur outside formal systems and they are characterized by a strong transformative potential and a commitment to social justice. The bottom-up response to crises in the cases revolves around mutual aid, sharing and cooperation. Because communities have a strong identification with their living space and social networks, they are sufficiently flexible and can organize themselves effectively in the face of a major crisis as shown by the Vitoria-Gasteiz community.

(c) Motivating people to change their habits and partake in action amidst climate crises requires a high level of commitment and the use of creative and flexible approaches. This may involve questioning aspects of everyday life, experimenting with better ways of living together and creating egalitarian political structures. It is important to sensitize communities to nature so that they 'notice' it in a conscious way. That allows them to better understand the dependencies of ecosystems and the consequences of their transformation. This can involve the use of unconventional tools, such as citizen science to motivate a community to adapt, such as at Twin Oaks.

In our work, we have aimed to highlight the importance of co-creation in deeper adaptation. We have used lessons learned from our research within the framework of the 'Co-Adapt: Communities for Climate Change Action' project and related fieldwork. In this context, co-creation involves spending time

together and building resilient and respectful relations through creative activities, allowing participants to design new land use, share knowledge, learn and anticipate the consequences of their actions. The ethnographic data informed the lab design process in motivations and encouraging synergies between different co-benefits to adaptation, such as social well-being. The case studies presented have highlighted that co-creation and adaptation happen all the time, especially in times of crisis, and that they can be used to increase resilience. The effectiveness of approaches depends on social connectedness, flexibility and the ability to observe and react to changes.

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