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PRACTICE INSIGHTS

Co-designed Projects in Ecological Research and Practice

Co-design: Working with farmers in Europe to halt the loss of biological diversity

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Abstract

1. Biodiversity loss in European agricultural landscapes is progressing rapidly despite a growing number of conservation efforts. One of the reasons for this is that farmers do not have enough decision-making power and do not receive adequate advice to tailor conservation measures to local conditions and regional biodiversity targets.
2. In this paper, we therefore address the potential and practical implementation of co-designing conservation measures through close collaboration between farmers and other stakeholders (e.g. other practitioners, conservation experts, agricultural advisors, scientists and policymakers).
3. Based on interviews with four researchers from ongoing European co-design projects, one national and one European farmers' organizations, we discuss the challenges and provide recommendations for co-design in the context of biodiversity conservation in agricultural landscapes.
4. Our aim is to reach scientists, practitioners and local decision makers working on innovative and locally adapted conservation efforts.

KEYWORDS
agriculture, agri-environmental measures, biodiversity, co-creation, co-design, conservation, co-production, landscape, participation, stakeholder

1 | INTRODUCTION

The loss of biodiversity in European agricultural landscapes, which also affects the provision of ecosystem services, is an existential problem for humanity (Mupepele et al., 2021; Pe'er et al., 2020). One reason for the extensive loss of species is the homogenization of land use and the intensification of agricultural production (Clough et al., 2020). Policy instruments designed to protect the environment in agricultural landscapes, such as greening measures and agri-environmental and climate measures of the European Union (EU), are in place but have proven only partial successes (Batáry et al., 2015; Tyllianakis & Martin-Ortega, 2021). The main criticism of the EU's Common Agricultural Policy (CAP) relates to cost-intensive area-based payments, which are not linked to measurable environmental outcomes (Mupepele et al., 2021; Pe'er & Lakner, 2020). Moreover, the ecological rationale behind conservation measures is often not communicated to farmers, which has decreased their motivation, acceptance and implementation success (de Snoo et al., 2013).

In summary, there is a consensus that existing measures and policy instruments need to be better adapted to local conditions in order to achieve current politically set biodiversity targets (e.g. EU Biodiversity Strategy 2030) (Leventon et al., 2021; Mupepele et al., 2021; Pe'er & Lakner, 2020; Pe'er et al., 2020; Visseren-Hamakers et al., 2021). The role of farmers in shaping these measures and policies could be of paramount importance, as they hold local knowledge and are the ones who ultimately implement conservation measures (Lacombe et al., 2018). Currently, farmers are caught between competitive pressures that force them to produce at low cost and societal expectations as well as environmental demands, requiring them to conserve land for biodiversity and the provision of ecosystem services (Burton, 2004; Busse et al., 2021; Deuffic & Candau, 2006). At the same time, farmers know very well the environmental characteristics of the land they farm and its production potential. It goes without saying that not all farmers are equally willing to engage with conservation measures and integrate them into their farming practices. They therefore deserve more targeted financial and greater social recognition of their efforts and—perhaps even more importantly—a voice and active role in designing new conservation policies and measures (Hanley et al., 2012; Hannus & Sauer, 2021).

In this paper, we therefore address the co-design of conservation measures to halt the loss of biodiversity in agricultural landscapes. Co-design is a term that, similarly to co-production or co-creation, often appears in transdisciplinary research in sustainability science and describes intensive collaboration between practitioners and researchers (Kurle et al., 2022; Lacombe et al., 2018; Lang et al., 2012; Mauser et al., 2013; Norström et al., 2020; Wyborn et al., 2019). Hakkarainen et al. (2021) recently compared the different 'co-concepts' and conceptualized co-design, following Mauser et al. (2013), as a first step in the process of co-creating knowledge, 'where actors articulate their positions, determine the concepts, the skills and the solutions'. However, scholars in design studies (e.g. Zamenopoulos & Alexiou, 2018), agronomy (e.g. Lacombe et al., 2018) or natural resource management (e.g. Shackleton et al., 2019) define co-design as a joint development of solutions for practical problems. In this paper, we use the latter concept and refer to co-design as the conceptual development and participatory design of conservation measures for a specific region (typically at the landscape level) through close collaboration between farmers, scientists and other stakeholders (e.g. other practitioners, conservation experts, agricultural advisors, policymakers).

Our aim is to discuss the importance of co-design in the context of farmland biodiversity conservation and to explore its implementation in more detail. We conducted interviews with four researchers of ongoing European projects with a focus on co-design and two representatives of farmers' organizations in Europe to provide practical evidence of co-design processes. We specifically asked why and how co-design efforts can lead to successful conservation outcomes. We address some general challenges of transdisciplinary research and provide specific recommendations for implementing co-design in the context of farmland biodiversity conservation. Our goal is to reach scientists, practitioners and local decision makers working on innovative and locally adapted conservation efforts.

2 | MATERIALS AND METHODS

To identify potential interviewees, we reviewed publications and websites of ongoing research projects in which scientists work closely with farmers to improve conservation efforts. Given the large number of local or regional initiatives and projects, we selected projects that are multi-site, have a national to multinational scope, are based in Europe and rely on co-design approaches as an active involvement and participation of farmers. Five ongoing projects resulted from this search (see Table 1 and Supporting Information S1 for a brief description of the projects).

With the exception of the FABulous Farmers project, we were able to arrange interviews with all the projects and speak with researchers who play a coordinating role in these projects. We also conducted interviews with one national and one European farmers' organization (Cooperativas Agro-alimentarias Español and Copa Cogeca) to include the perspective of farmers' representatives on co-design. All six interviews included questions about key stakeholders, forms of interaction and experiences with the advantages and disadvantages of co-design (Supporting Information S2). We also asked the researchers about the general project goals and their specific definition and implementation of co-design. On average, the interviews lasted about 45 min. An interview protocol was written and all interviews were analysed by identifying key statements via inductive coding (Kuckartz, 2014). The statements were sorted according to the following themes: 1. Definition of co-design; 2. Goal of co-design processes in the context of biodiversity conservation; 3. Key stakeholder; 4. Course of the process; 5. Difficulties in the cooperation between stakeholders; 6. Challenges regarding the co-design process in comparison to classical participatory research pathways; and 7. Criteria for success. The key statements and the number of interviewees who expressed them are the main results and can be found in Supporting Information S3.

TABLE 1 Overview of the five selected projects currently working with farmers in a co-design process to improve conservation efforts in agricultural landscapes

Project (location, time frame)	Main motivation	Main actors in the co-design	Main methods of the co-design
F.R.A.N.Z.—Future Resources, Agriculture & Nature Conservation https://www.franz-projekt.de/ (Germany, 2016–2022, planned until 2026)	Development and testing of measures for the conservation and promotion of biodiversity in agricultural landscapes	Farmers, scientists, advisors, associations and foundations from agriculture and nature conservation	Joint planning processes, semi-structured interviews, group discussions, demonstration farms
FInAL (Facilitating insects in agricultural landscapes) https://www.final-projekt.de/ (Germany, 2018–2022)	Development, implementation and evaluation of measures to promote insect biodiversity and ecosystem services by insects in agricultural landscapes	Farmers, scientists, institutions responsible for the maintenance of waysides and riparian strips, beekeepers, advisory services, biogas plant operators	Semi-structured interviews, co-design workshops, participatory mapping, interactive field visits
SURE Farm—Towards SUstainable and REsilient EU FARMing systems https://www.surefarmproject.eu/ (13 European countries, 2017–2021)	Improving the resilience and sustainability of farms and farming systems in the EU	Farmers, scientists, farmers associations, policymakers, pesticide producers, local insurance companies and banks, non-partner scientists	Online platform, workshops, focus groups
Contracts 2.0—Innovative contracts for farmers and nature https://www.project-contracts20.eu/ (nine European countries, 2019–2023)	Development of novel contract-based approaches to incentivize farmers for the increased provision of environmental public goods	Farmers, scientists, farmers' organizations, extension service providers, environmental NGOs, companies, local public administrations	Contract innovation labs: offering open and inclusive spaces for participation, cooperation and reflective social learning
FABulous Farmers https://www.fabulousfarmers.eu/en (five European countries, 2019–2023)	Supporting farmers in the transition to more agro-ecological practices	Farmers, scientists, citizens, policymakers, landowners, municipalities	Demonstration farms, regional networking sessions, farmer–citizen meetings

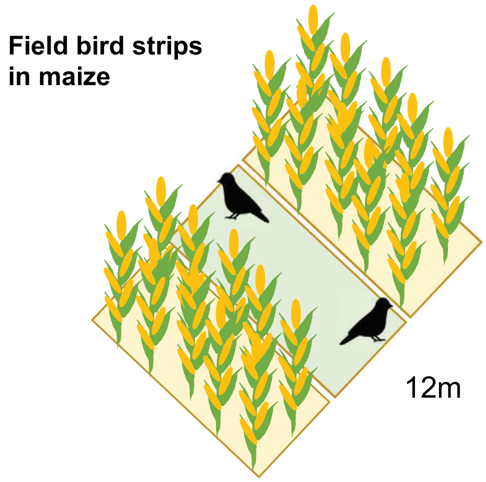
In Section 3.3, additional literature sources were consulted to support the insights gained in the interviews about the advantages and challenges of co-design. Finally, the authors of this manuscript met for an online workshop to develop the recommendations for improved co-design summarized in Table 2, based on the findings from the interviews and the literature review.

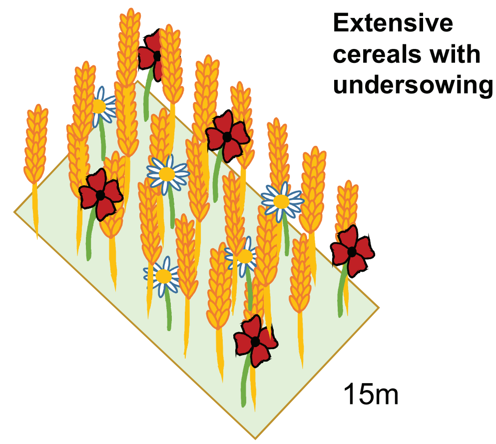
3 | RESULTS

3.1 | Goals of co-design in the context of biodiversity conservation

The results of our interviews showed that interviewees shared a common understanding of co-design in the context of agricultural biodiversity conservation, reflecting the definitions in the current literature (Hakkarainen et al., 2021; Marin et al., 2016; Page et al., 2016). Co-design was described in the interviews as a process of shared learning that facilitates a continuous eye-to-eye exchange between farmers, scientists and other stakeholders over time. The goal of co-design was defined as the joint development of practical, locally adapted and economically viable solutions for biodiversity conservation. Respondents indicated that co-design helps build trust among stakeholders, empowers farmers and improves adoption and implementation of conservation measures at the landscape level. In essence, it is about achieving a different level of cooperation where stakeholders are equal partners and jointly take decisions.

Box 1 exemplarily shows two co-designed biodiversity conservation measures developed jointly by farmers, agricultural advisors and scientists that are currently being tested on demonstration farms in the F.R.A.N.Z. project. These measures have been developed for regions with specific site or land use conditions (e.g. high proportion of maize) and several specifications of the measure design have been defined. These specifications include the minimum width of the strips or fields, the possibility of applying mineral fertilizers or pesticides, specific dates for tillage and sowing and the definition of crops and row spacing (Box 1). These measures do not differ significantly from those already in place under the Common Agricultural Policy. However, the interviewees pointed out that co-design helps both scientists and farmers to develop a better understanding of how to effectively implement measures in the respective landscape context. The aim here was to achieve the greatest possible acceptance and ecological impact.





- For regions with a high proportion of maize
- Strips can be established as fallow (left to self-vegetate until 31/07), extensive cereals (sown at double row spacing, starting 01/03) or as a summer crop (sown until 31/03)
- Early tillage of the maize until 31/03
- No mineral fertilizers or pesticides
- Minimum width of 12 m, often 36 m

- For regions with low weed potential
- Established either as a strip or a field
- Cereals sown in double seed row spacing with an undersowing of at least four flowering species
- No turnover of the soil until 31/08
- No mineral fertilizers or pesticides
- Minimum width of 15 m

BOX 1 Examples of co-designed measures for biodiversity conservation from the F.R.A.N.Z. project

3.2 | Characteristics and workflow of the co-design process in the studied projects

Although the way co-design is carried out (including main actors and methods; Table 1) differed among projects, all interviewees described co-design as an intensive, interactive and adaptive process, the outcome of which can only be achieved by bringing together diverse knowledge. Farmers, scientists, agricultural advisors and local authorities were mentioned as important stakeholders in all interviews. Regular, on-site meetings were mentioned as the most important interaction format. Finally, it was emphasized that the choice of the actors and interaction formats depends strongly on the project and the region. A key feature of the process seems to be that stakeholders are no longer seen as recipients of information or suppliers of feedback, but as equal contributors and co-creators of visions, actions and knowledge. The integration of plural values, stakeholder empowerment and the adaptive capacity are seen as integral components of co-design processes, as is the case in the recent literature on transforming governance systems to halt biodiversity loss (Leventon et al., 2021; Visseren-Hamakers et al., 2021).

We asked not only about the most important stakeholders but also about the specific way in which stakeholders, and farmers in particular, are engaged. The majority of the interviewees described that co-design in their projects started with the selection and invitation of relevant stakeholders. To avoid biased selection of already known stakeholders, stakeholder mapping helped to select them more objectively. For example, appeals through the regional farmers' associations can reach a large number of farmers. Sometimes public events were held in the pre-phase to inform the relevant groups about the co-design project. The organizers of such a meeting should encourage 'Peer2Peer' exchange among farmers and involve people who are already familiar with local actors, such as landscape management associations or agricultural advisors. Moreover, several one-to-one meetings with farmers were held before the group meetings, which were considered important to clarify the expectations and needs of the participants. The first joint meetings were typically used to develop a common vision and goal of the co-design process (e.g. transition towards more sustainable agriculture). Further meetings were used to jointly develop and test new conservation measures on demonstration farms. In this phase of the process, regular meetings were held with the core team of farmers, agricultural advisors and researchers to reflect and adjust the design of the measures. Specifications, such as the timing of tillage or row spacing, could be determined at this stage and were usually based on the results of a biodiversity monitoring that had been carried out or on farmers' experience in implementing the measure.

Based on these interview results, we propose to divide the co-design process for conservation measures in agriculture into four steps (Figure 1). They include (1) a pre-phase involving problem definition, stakeholder mapping and one-to-one meetings; (2) a co-starting phase including initial meetings with the whole group of stakeholders and a joint definition of expectations and goals; (3) an iterative phase with meetings to jointly develop and test conservation measures; and (4) a synthesis phase to evaluate and disseminate the findings.

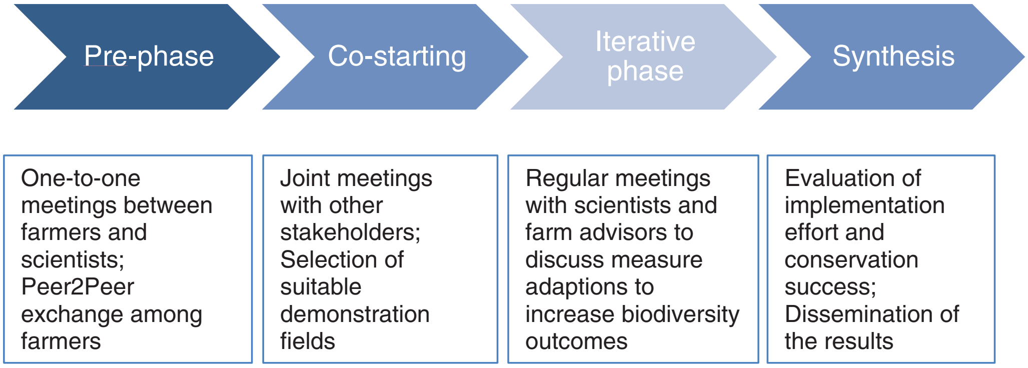


FIGURE 1 General phases of the co-design process derived from the findings of the interviews conducted in this study, including the particular role of farmers in each of these phases

3.3 | Advantages and challenges of co-design with farmers

The benefits that were clearly mentioned by all interviewees were that farmers get a stronger say in the development of conservation measures and policy instruments and that the process creates a basis of trust, which is necessary for the implementation of innovative ideas in nature conservation. In addition, it was mentioned that the local knowledge that farmers and other local actors hold can be better utilized and thus biodiversity conservation strategies can be adapted to local conditions. The iterative phase of the process allows for a testing of conservation measures on suitable farms, which can increase their long-term acceptance, feasibility and ecological effectiveness on other farms as well. Finally, farmers can become ambassadors of new ideas within their farming communities. Several difficulties were mentioned, which we divided into difficulties in collaboration between stakeholders and difficulties related to the co-design process compared to traditional participatory research pathways (see Supporting Information S3 for the full list). We grouped all of the stated advantages and disadvantages into two overarching advantages and one challenge and in the following section support these with findings from recent studies.

1. **Collective knowledge and action are needed to conserve farmland biodiversity**: As developing conservation measures for farmland biodiversity is particularly challenging, various studies highlight the need to leverage collective knowledge from multiple disciplines (e.g. agroecology, agronomy, nature conservation management) and as well as academic and non-academic stakeholders (Lang et al., 2012; Leventon et al., 2021; Norström et al., 2020). Participatory approaches, as opposed to top-down or expert-driven approaches, have already been shown to increase farmer motivation to implement conservation measures, especially in the long term (Dawson et al., 2021; Sterling et al., 2017). Scientists, on the other hand, can draw inspiration by making an impact on the real world through working with practitioners and can thereby feel empowered to support conservation efforts in agriculture (Martin et al., 2018).
2. **Co-design allows for adaptation to local conditions**: While to date, adapting conservation measures to local ecological and socioeconomic conditions remains difficult, co-design can take into account regional biodiversity objectives, specific costs and challenges in designing new measures (Hanley et al., 2012). In this way, more targeted payments and appropriate economic incentives for farmers can be developed (Franks & Emery, 2013). Moreover, the iterative phase of co-design allows measures to be tested on field, which increases their feasibility for implementation. As the measures are primarily designed by stakeholders who act at landscape level, the measures can potentially be implemented in a coordinated manner within the landscape, for example, to create larger corridors and connect habitats (Batáry et al., 2015).
3. **Co-design processes are time-consuming and the outcome is uncertain**: The biggest challenge is that the co-design process is more costly than other decision-making processes (Page et al., 2016). Much time is required to inform local stakeholders in the pre-phase and for establishing common understandings and visions during the co-start phase and for maintaining a relationship of trust throughout the entire project time. As mentioned in the introduction, there are very different demands on the management of land and the potential for conflicts that impede the co-design process is high (Chambers et al., 2021; Lang et al., 2012). In addition, there is a risk that project outcomes will remain vague, when they apply only to specific demonstration farms or lack political legitimacy (Lang et al., 2012). The challenges vary depending on what the interests and values of the different stakeholders are. If they are more aligned, less time is needed to find a shared understanding of the problem and a shared vision for a solution and outcomes are likely to be more specific (Page et al., 2016).

3.4 | Recommendations for action

When asked about the challenges of co-design, respondents also provided 'success criteria' (i.e. recommendations) for overcoming these challenges (Supporting Information S3). To provide concrete guidance for action, we organized both the challenges and the specific recommendations according to the four phases of the co-design process (Table 2). Table 2 should not be understood as an incontrovertible, final list that can be used as a blueprint for all sorts of co-design projects. In fact, some recommendations reoccur at different stages

TABLE 2 Challenges (sub-headings) and recommendations (bullet points) on how to deal with them, ordered by the stages of the co-design process

Pre-phase

Difficulty of applying for funding as some specific project goals cannot be defined ahead of the co-design
- Define the co-design process as a goal in itself.*
- Explain the societal and scientific advantages of this approach.*
- Raise the awareness of funding agencies on the importance of co-design in agriculture.*

Identification and inclusion all relevant stakeholders
- Conduct proper stakeholder analysis.
- Hold public events to inform the relevant groups about the project and connect with farmer associations and landscape management associations.
- Design the project in such a way that new stakeholders can be added over time, such as farmers who might join after sharing with like-minded colleagues.*

Thoroughly understanding the situation from different viewpoints
- Hold several one-to-one meetings and analyse different perspectives before group meetings.
- Conduct joint visits in the agricultural holdings and on the agricultural land to clarify challenges and understand stakeholders' perspectives.
- Consider different size, structure and specialization of the farms involved.*

Limited motivation or capacities of local stakeholders to participate
- Raise awareness for the chance to contribute to a long-term transition in the agricultural policy.*
- Clarify the benefits that can be provided to stakeholders (e.g. social networking).
- Clarify the possibility to financially reward practitioners for their participation.
- Adjust the meetings to the schedule of the farmers.

Co-start

Difficulty of jointly defining goals and visions by all participants
- Ensure that there is sufficient capacity and time to discuss the problem from different angles.
- Define common visions (e.g. transition towards more sustainable agriculture) instead of specific goals.

Existing or new conflicts between stakeholders can arise, obstruct decisions and impede the process
- Involve all relevant stakeholders as early as possible.
- Discuss current problems, as well as potential risks and opportunities that are common to all participants (e.g. climate change, food prices).
- Use sound facilitation and moderation to ensure that all stakeholders can contribute on an equal footing. Use conflict mediation approaches to solve conflicts.
- Determine clear contact persons for each stakeholder group that are located in the area.

Iterative phase (joint development and testing of conservation measures)

Difficulty to develop innovative solutions that work on the ground
- Realize that both practitioners and scientists must learn flexibility, shared learning and creativity.
- Maintain flexibility in the agenda and creative approaches that promote innovation.
- Promote a continuous dialogue and exchange (including Peer2Peer exchange).

Limited motivation or capacities to keep up regular meetings
- Carefully prepare the setting and topics for the workshop, as these will influence everyone's willingness to continue the process.
- Beware of external framing conditions (e.g. CAP) and adjust the content of the meetings accordingly.
- Adapt the workshop frequency and duration to the existing capacities and the farming calendar.
- Conduct field visits and practices complementary to indoor workshops.

Ensuring the feasibility and effectiveness of the co-designed measures
- Use expert knowledge and advisory services, for example from farm consultants and local conservation experts.
- Enable testing and adaptions of measures, including a biodiversity monitoring, in which farmers can be involved if interested.

Synthesis

Embedding the designed measures into existing policy instruments*
- Consider from the outset the transferability and consolidation of the measures developed, for example to other farming conditions.*
- Involve local and regional politicians and administrations.
- Consider how the measures can be established outside existing policy instruments (e.g. via private partners and funding).*
- Promote the uptake of co-designed measures in existing policies (e.g. agri-environmental schemes) at different levels of governance.*

Difficulty to evaluate the success of the co-design
- Establish monitoring services to oversee biodiversity successes.
- Use feedback forms on a regular basis to allow for continuous evaluation of the process and to reflect on the goals set.*
- Document the process and decisions to evaluate the process in itself.

Note: In a few cases, the authors of this paper defined additional challenges and recommendations, which are marked by an asterisk (*).

of the co-design process and other recommendations only fit individual projects. Ultimately, our recommendations must be adapted to the specific project, stakeholders and region.

4 | CONCLUSIONS

In the context of the biodiversity crisis, solutions to conserve species and their habitats need to be found quickly that are cost-effective, practical and adaptable to local conditions (Dawson et al., 2021; Sterling et al., 2017). In this paper, we only reflect on and summarize the experiences of selected projects and experts. However, our findings highlight that co-design processes at the landscape level provide great opportunities to develop conservation measures in such a way that they meet the broadest possible acceptance among the impacted stakeholders (acceptability), can be implemented in practice (feasibility) and are efficient from both an ecological and economic point of view (efficiency). Especially in the case of major changes and innovative ideas (e.g. building corridors, reducing field sizes, introducing extensive crop management), co-design processes can help that several farmers in a region explore new paths together. Since the implementation of co-design is challenging, the recommendations given in this study should help guide the work of farmers, scientists or local decision makers who want to initiate and facilitate co-design processes. Local stakeholders can use our recommendations to understand how they can get involved in or support co-design. Finally, our recommendations are intended to provide a framework for funding agencies to determine whether research projects incorporate a meaningful co-design approach and whether specific risks and challenges have been considered.

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AUTHOR CONTRIBUTIONS

Lisanne Hölting, Stefanie Bülow, Jan O. Engler, Nina Hagemann, Maria Lee Kernecker, Neele Larondelle, Astrid Sturm, Frank Wätzold and Anna F. Cord conceived of the manuscript. Lisanne Hölting drafted the initial manuscript and conducted expert interviews. All authors contributed critically to the drafts and the online workshops and gave final approval for publication.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The guiding questions and the thematically coded main results of the interviews can be found in the Supporting Information. The authors confirm that no other data set was used or generated.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

S1: Description of the co-design projects considered for the interviews.

S2: Information provided to respondents prior to the interview.

S3: Main results of the interviews, sorted by topic and indicating the number of interviewees (n = 6) who stated the key statements.

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