









Research, part of a Special Feature on [Meaningful Transdisciplinary Collaborations for Sustainability: Local, Artistic, and Scientific Knowledge](#)

9 Dimensions for evaluating how art and creative practice stimulate societal transformations

[Joost M. Vervoort](#)¹ , [Tara Smeenk](#)¹, [Iryna Zamuruieva](#)², [Lisa L. Reichelt](#)¹, [Mae van Veldhoven](#)¹, [Lucas Rutting](#)^{1,3} , [Ann Light](#)^{4,5} , [Lara Houston](#)⁶ , [Ruth Wolstenholme](#)², [Markéta Dolejšová](#)⁷ , [Anab Jain](#)^{8,9} , [Jon Arden](#)⁸, [Ruth Catlow](#)¹⁰, [Kirsikka Vaajakallio](#)¹¹, [Zeynep Falay von Flittner](#)¹², [Jana Putrle-Srdić](#)¹³, [Julia C. Lohmann](#)⁷ , [Carlen Moosdorff](#)¹ , [Tuuli Mattelmäki](#)⁷ , [Cristina Ampatzidou](#)¹⁴ , [Jaz Hee-jeong Choi](#)¹⁵ , [Andrea Botero](#)⁷ , [Kyle A. Thompson](#)¹ , [Jonas Torrens](#)¹ , [Richard Lane](#)¹ , and [Astrid C. Mangnus](#)¹⁶ 

ABSTRACT. There is an urgent need to engage with deep leverage points in sustainability transformations—fundamental myths, paradigms, and systems of meaning making—to open new collective horizons for action. Art and creative practice are uniquely suited to help facilitate change in these deeper transformational leverage points. However, understandings of how creative practices contribute to sustainability transformations are lacking in practice and fragmented across theory and research. This lack of understanding shapes how creative practices are evaluated and therefore funded and supported, limiting their potential for transformative impact. This paper presents the 9 Dimensions tool, created to support reflective and evaluative dialogues about links between creative practice and sustainability transformations. It was developed in a transdisciplinary process between the potential users of this tool: researchers, creative practitioners, policy makers, and funders. It also brings disciplinary perspectives on societal change from evaluation theory, sociology, anthropology, psychology, and more in connection with each other and with sustainability transformations, opening new possibilities for research. The framework consists of three categories of change, and nine dimensions: changing meanings (embodying, learning, and imagining); changing connections (caring, organizing, and inspiring); and changing power (co-creating, empowering, and subverting). We describe how the 9 Dimensions tool was developed, and describe each dimension and the structure of the tool. We report on an application of the 9 Dimensions tool to 20 creative practice projects across the European project Creative Practices for Transformational Futures (CreaTures). We discuss user reflections on the potential and challenges of the tool, and discuss insights gained from the analysis of the 20 projects. Finally, we discuss how the 9 Dimensions can effectively act as a transdisciplinary research agenda bringing creative practice further in contact with transformation research.

Key Words: *art; creative practice; evaluation; transdisciplinarity; transformation*

INTRODUCTION

In the face of global ecological crisis, there is an urgent need to change current systems at the deepest levels (Steffen et al. 2015, Bai et al. 2016). Transformations to a more sustainable world include changes to material and economic conditions and systems (van Oers et al. 2021). But they also include changes in the realm of the symbolic—foundational myths, paradigms, and systems of meaning—to open new collective horizons for action (Leventon et al. 2021).

Creative practices are uniquely suited to help stimulate transformation at these deeper leverage points (Galafassi et al. 2018, Hawlina et al. 2020, Moore and Milkoreit 2020). There is a growing interest among policy makers and funders in both cultural and sustainability sectors in demonstrating and utilizing the transformative potential of creative practices (Vervoort et al. 2023a). Creative practitioners themselves share this desire as well. However, so far there is little understanding of how to evaluate the transformative potential of creative practices concretely. Academic research on the links between creative practices and sustainability transformations is growing, but still fragmented and lacking in inter- and transdisciplinary integration (Light et al. 2019).

We define “creative practices” here as the arts in their fullest sense, including related practices such as design (Dolejšová et al. 2021). We include professional and non-professional work that uses personal and/or collective craft skills and ingenuity to make something new, renew, or reinterpret some aspect of the world: from writing, art, and theatre to designing to participatory community development to storytelling (Light et al. 2019). We use the word “stimulate” to describe the general effect of creative practices regarding sustainability transformations, to emphasize that we do not see these relationships as mechanical in a causally simple manner. As we will see, there are many ways in which creative practices help stimulate shifts in meanings, connections, and power.

In this paper we aim to support efforts to connect creative practice and sustainability transformations. We report on a transdisciplinary process that led to the identification of 9 dimensions of transformative change through creative practice. These 9 dimensions of change were framed together with creative practitioners, funders, and policy makers in an iterative dialogue with researchers and literatures. The intended contribution of our work is twofold:

¹Copernicus Institute of Sustainable Development, Utrecht University, ²Sniffer, ³CGIAR Initiative on Climate Resilience (ClimBeR), ⁴School of Engineering and Informatics, University of Sussex, ⁵Faculty of Culture and Society, Malmö University, ⁶Global Sustainability Institute, Anglia Ruskin University, ⁷School of Arts, Design and Architecture, Aalto University, ⁸Superflux, ⁹Design Investigations University of Applied Arts Vienna, ¹⁰Furtherfield, ¹¹Hellon, ¹²Falay Transition Design, ¹³Kersnikova, ¹⁴RMIT Europe, Copernicus Institute of Sustainable Development, ¹⁵Civic Interaction Design, Amsterdam University of Applied Sciences, ¹⁶The Netherlands Environmental Assessment Agency

1. We aim to support creative practitioners, policy makers, funders, and others in the very practical challenge of how to speak with one another about the value of creative practice for sustainability transformations, and how to evaluate or reflect on creative practices, both in terms of specific practices and in a comparative mode across many practices.
2. We seek to contribute to research on the roles of creative practice in sustainability transformations by opening up and bringing together many relevant dimensions of change that have heretofore either been discussed separately, or outside of the context of sustainability transformations. To do this, we have created a multidimensional frame that opens up ontological space: what realities are being considered. This way, the 9 Dimensions are both the result of a transdisciplinary exchange and an invitation for more integrative transdisciplinary research.

We first elaborate on sustainability transformations and their links with creative practice. We then discuss the challenge of evaluations, and how evaluation can itself be considered a leverage point for change. We describe the transdisciplinary process of creating the 9 Dimensions, and describe the 9 Dimensions, their relationships to sustainability transformations, and the questions connected to them. We present an example of how these 9 Dimensions were applied, using them to evaluate and reflect on 20 creative practices across the European project CreaTures, and the key insights resulting from this analysis. Based on this example, we discuss the potential of the 9 Dimensions approach for helping to understand and assess links between creative practice and sustainability transformations.

THEORY

Creative practices, sustainability transformations, and transdisciplinarity

The concept of “transformation” in the context of sustainability is a boundary concept bringing together many strands of research (Feola 2015). Transformations refer to fundamental, structural changes to systems and societies, but as shown in seminal writing by Meadows (1999) they can be approached at many different levels, from changes to stocks and flows in systems to deep changes in the fundamental meaning-making paradigms that systems are rooted in. As the deeply existential nature of the global ecological and climate crisis becomes ever more painfully clear (Fazey et al. 2021), researchers and practitioners have focused on what Meadows describes as the deepest leverage points in systems: transformations in fundamental ways of making sense of the world (Davelaar 2021). Many descriptions of desirable sustainability transformations are possible, and a degree of openness in such descriptions is important to safeguard space for collaborative processes. However, in this paper we align with the “deep leverage points” perspective and argue that there is a need for a rooting of societies in foundational myths, values, and imaginaries (Jasanoff and Kim 2015) that reflect an awareness of deep interconnectedness with natural systems; that embody care, empathy, and justice for all of life, with an explicit focus beyond the human. For the purposes of this paper, we speak of desirable system transformations when such shifts at deeper levels or meaning-making have permeated societies, and when social practices, democratic processes, and material processes align to

be expressions of these more interconnected, caring and just ways of being. This focus on deeper leverage points brings in the need for transdisciplinary approaches to change.

Creative practices have unique potential as ways to engage with deep leverage points; but to understand their value, diverse perspectives from research and practice are necessary. Academic work on the connections between creative practices and sustainability transformations tends to focus on very specific dimensions of creative practice, such as how it contributes to learning, how it stimulates imagination, or how power dynamics play out (Galafassi et al. 2018, Moore and Milkoreit 2020). At the same time, there are many literatures not yet connected to sustainability transformations but that do provide key insights into how different dimensions of creative practice connect to different aspects of societal change. These include insights from sociology, psychology, media theory, anthropology, cultural studies, feminist and decolonial studies, education studies, and more. There is a real possibility here for opening up research on sustainability transformations in many directions and to create new interdisciplinary collaborations. In addition, more work is needed to connect these academic perspectives to the lived insights of those engaging with creative work as creative practitioners, funders, and policy makers providing a basis for more transdisciplinary research.

Evaluating creative practices in the context of transformation: a practical challenge

There is a growing interest among policy makers, funders, researchers, and others in understanding how creative practices may contribute to societal change (Belfiore 2022a). This interest exists both on the side of the culture sector, where social impact has become increasingly important as a criterion for the support of creative practice, and on the side of various sustainability domains seeking to influence public understandings, values, perspectives, and behaviors (Vervoort et al. 2023a). The growing interest in social impact informs the framing of evaluations of impact around funding calls, policies, and more. And these attempts at impact evaluation shape, in turn, the possibility space for creative practitioners who have to respond to various criteria about their work.

Understandings of how such creative practices contribute to sustainability transformations are often limited. Because of the need for funders and policy makers to be accountable regarding their decisions to support creative practice, this often means that the evaluation of the impact of creative practices remains limited to simple measures such as numbers and demographics of attendees to an event, which may be valuable to understand who was involved, but do not give insights into change mechanisms (Belfiore 2009, Belfiore 2022b). Funders may ask for evidence of carbon footprint reduction in making creative work, but offer no capacity for informing on the impact of engaging with diverse populations on wider ecological issues, such as “a journey toward regeneration and greater equity” (Light 2022:38). For creative practitioners, this means that they often have to frame their practice in limited terms as well, leaving them less able to communicate how they understand the richness of their work. This is a challenge that emerges from both existing literature (Jancovich and Stevenson 2021) and from the dialogues with creative practitioners that form the basis of this paper.

The evaluation of creative practice touches on literature that is often not yet connected. Principal bodies of literature to draw on are (1) evaluation and theory of change in complex systems and transformation contexts (Davis et al. 2014, Barbrook-Johnson et al. 2020, Cox and Barbrook-Johnson 2021, Walton et al. 2021); and (2) the evaluation of arts and creative practice. This second category includes literature around arts policy more generally, which often comes down to concerns around evaluation (Caust 2003, Rajan and Chand O'Neal 2018, Meyrick and Barnett 2021, Belfiore 2022b).

Examining these bodies of literature, it becomes clear that the evaluation of creative practices in transformation contexts has to engage with two sources of complexity. First, transformational change toward more sustainable futures is widely understood to be a highly complex process, and not a matter of simple and clean causality. Transformation requires the re-imagining of ways of being, material processes, meaning-making, skills, and abilities; it requires shifts in power, shifts in what is being valued, the remaking of relations, and much more (Avelino 2017, Hebinck et al. 2018). Transformations are unpredictable and messy; failure or redirection of efforts is always a distinct possibility (Blythe et al. 2018). Furthermore, the contexts of creative practices are, more than ever, in flux themselves; it is certainly not a matter of helping to enact transformative change in an otherwise stable world. Complex systems-based evaluation approaches call for the need to take such complex contexts into account in evaluation processes (Barbrook-Johnson et al. 2020, Cox and Barbrook-Johnson 2021, Gates et al. 2023). Furthermore, there is the political question of whether governing actors understand and prioritize action to support sustainability transformations in the first place, or whether they are just interested in incremental “social impact” that maintains the status quo.

Second, creative practices themselves are complex. They involve many hard to grasp, entangled aspects of human experience (Casal 2021), and are not easily evaluated in terms of their societal impacts (van der Hoeven et al. 2021, Belfiore 2002). Arts evaluation literature critical of current systems points to the urgent need for more participatory, inclusive, and multi-dimensional approaches (Durrer et al. 2019, Dewinter et al. 2020).

In cultural policy research, there is a broad recognition that many currently used evaluation approaches, at least those that try to evaluate social impact, fail to capture and make transparent the value of creative practices, because of mainly being able to recognize more standardized and context-less, instrumental types of value, such as short-term, cost-benefit investment logics (Walton et al. 2021, Belfiore 2022b). The desire for quantifiable, one-size-fits-all approaches to social impact evaluation is not without merit, but it is not enough to capture the complexity of how arts and creative practice function in societies, or what their future possibilities might be. Moreover, funding and policy support are highly political and there are large power imbalances between those who have the funding and the means to support creative practice and those dependent on it. Actors in the cultural sector do not experience the safety needed to evaluate success or failure, and are primarily focused on the survival and promotion of their activities (Jancovich and Stevenson 2021). This is bad news from a transformation perspective. One of the key values of art and creative practice in the context of sustainability

transformations in complex systems is the ability to create unexpected outcomes (Patton 2019) and this value of creative practice clashes fundamentally with standardized evaluation processes that aim at pre-determined outcomes.

Imagination infrastructure: evaluation as a leverage point

The challenges around the evaluation of creative practices in terms of their contribution to sustainability transformations are clearly significant. But we see the societal interest in impact evaluation as a real leverage point for change as well. Evaluation processes reflect what societies value more broadly, and how they make sense and meaning (Weick et al. 2005). Evaluation can also be understood as relating to societal capacities to reflect. What is kept track of, and how does this shape how change is understood? Moreover, evaluation and translation are closely connected; evaluative processes allow different groups to speak to each other and make their activities legible (Weiss 1993).

Changing the ways in which creative practices are evaluated could therefore entail a shift in paradigms, values, and goals in a way that has very concrete consequences for material support, information flows, and more. Following the work of systems innovator Cassie Robinson, we choose to describe evaluation as a significant part of “imagination infrastructure” (Robinson 2023). Those involved with impact and evaluation can work to change criteria, framings, and narratives in a way that supports creative practice that may truly contribute to sustainability transformations.

In both practice and academic literature, there has been a call for a shift to more bottom-up, co-designed, narrative-based evaluation approaches, supported by rich evidence provided through diverse methods (West et al. 2020, Leventon et al. 2021, van der Hoeven et al. 2021). This expansion of vocabularies beyond limited notions of impact is important for creative practitioners to be able to speak about their work, but also for governing actors to build their own understanding and language around the evaluation of creative practice to respond to their own institutional contexts, peers, and program leaders. In this expansion of evaluation vocabularies, there should be an explicit recognition of the power dynamics that are inherent in evaluation. This recognition should, in turn, be embedded in the development of broader understandings of the role of power in sustainability transformations (Feola 2015, Avelino 2021, van Oers et al. 2021).

The 9 Dimensions tool in context

The effort to connect the evaluation of creative practices to sustainability transformations came out of a transdisciplinary research project between academics and creative practitioners all throughout Europe: the Horizon 2020 project *CreaTures - Creative Practices for Transformational Futures* (CreaTures 2023a, CreaTures 2023b). The CreaTures project took 3 years from the beginning of 2020 to the end of 2022. A core activity of the project was the support and development of 20 creative projects, known as “experimental productions,” around sustainability transformations, known as the Laboratory (CreaTures 2023c, CreaTures 2023d). The 20 experimental productions were [specifically selected](#) by the project to counter the paradigm that sees art-science collaborations as focused on packaging science in more engaging formats. Instead, these productions were selected to be interactive, caring, socially engaged, embodied, experiential, and focused on the representation of diverse ways of knowing and being (Light

et al. 2024). The experimental productions included live action role plays, experiential journeys, installations, interpersonal practices, co-creative lab experiments, and more (Dolejšová et al. 2021). This Laboratory was connected to an Observatory (CreaTures 2023e, Houston and Light 2023) that researched the projects and similar creative practices; and an activity focused on Evaluation (CreaTures 2023f, Vervoort et al. 2023b). An Engagement activity connected the CreaTures project to various stakeholders and the public through events and media productions, reaching around 340,000 people (Baraona et al. 2023, CreaTures 2023g).

The fruits of the [CreaTures project](#) were captured in the [CreaTures framework](#) website, which was designed to provide different engagement pathways for creative practitioners, funders, policy makers, and researchers. This framework was designed with these user groups in mind; and the 9 Dimensions tool's design on the website as part of this framework follows that design logic. This paper provides more depth on the research process and results that support the framework.

METHODS AND RESULTS

Process: a transdisciplinary effort

The idea for the 9 Dimensions tool originated in two workshops. The first was a literature scoping of evaluation and theory of change around sustainability transformations, featuring the project's research partners. The second workshop involved research and creative practitioner partners. This second workshop approached the question of evaluation by starting with the creative practitioner perspectives, because the literature showed that creative practitioners often have to translate their work to the framings of funders and policy makers. In the workshop, participants were asked to describe how they understood the impact of their practice through the question "what does your creative practice do in the world?" This workshop brought out an understanding that practitioners' ideas about how their practices connect to sustainability transformations involve many dimensions of change.

Figure 1 shows the transdisciplinary nature of the development of the 9 Dimensions tool, further explained below. Throughout different steps in the tool's development, collaborative efforts by researchers across different disciplines, creative practitioners, and funders and policy makers happened in an iterative fashion. The transdisciplinary nature of the project made this a very challenging but productive process. In the research team itself, significant methodological and theoretical starting points had to be bridged between researchers coming from design, science and technology studies, anthropology, sustainability science, and complex systems research. Beyond the researchers, creative project partners also brought different ways of thinking, from commercial, consultancy-style approaches to primarily arts-based practices and outlooks. Likewise, funders and policy makers had different understandings and priorities. A key tension that emerged throughout the project was between a desire for artistic openness, space for ambiguity, and pluralism on the one hand and an interest in comparative analysis, structure, and systems-based approaches on the other hand. The development of the 9 Dimensions tool became a boundary process around which shared languages and greater mutual understandings were

being developed. The resulting tool seeks to provide a balance between openness in language and framing on the one hand and structure and comparability on the other. More details about the research process can be found [here](#).

Using the notion of dimensions

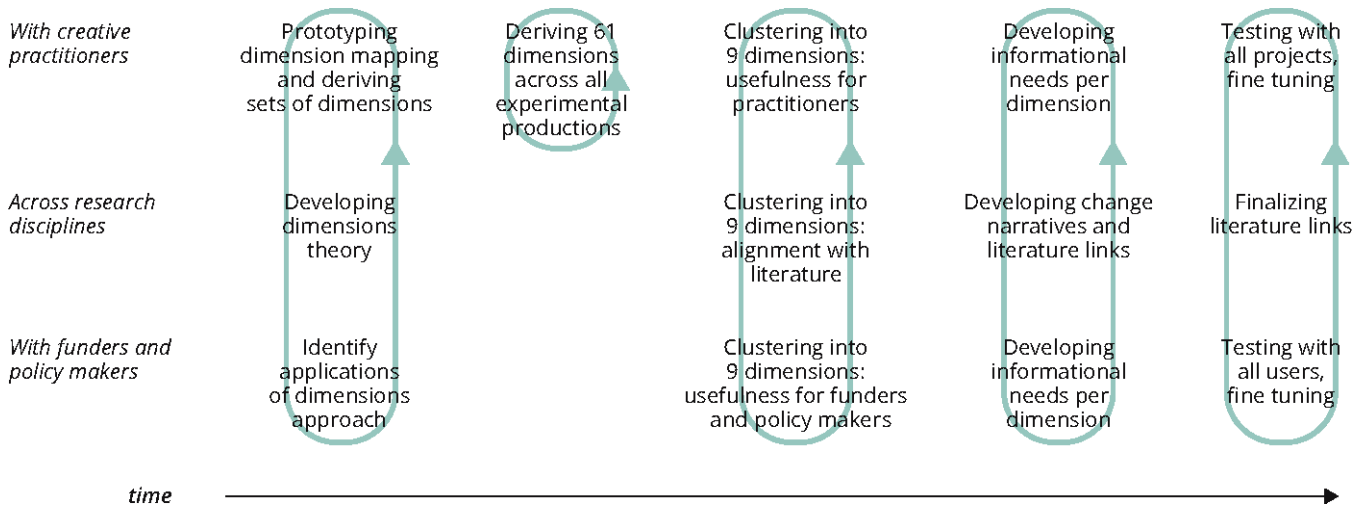
The idea that evaluation should better reflect this practitioner-driven dimensionality led to the design and prototyping phase of what would become the 9 Dimensions tool. We drew on the notion of "dimensions" from earlier work by the lead author on change agents in social-ecological systems change (Vervoort et al. 2012). In this field, there has been a strong focus on approaches that allow for the mapping of diverse aspects of complex sustainability practices. However, social-ecological systems research often focuses on which "scales" (temporal, geographical) and "levels" (the community, the ecosystem) are used. Vervoort et al. (2012) argue there is a need to recognize that such scale analyses in fact only explore a limited set of "dimensions," such as time and physical space, that are simply assumed to be the best and only way to characterize the realities of complex systems.

When practitioners are themselves allowed to define the most relevant dimensions for change processes, new insights may arise. We detected an interest in "affective prefiguration" (Light 2023) or the attempt to create emotional experiences that could "change us by giving a foretaste of what radical respect for life might be like" (Light 2023:27), which indicates how far from a scalar approach our categories needed to stretch.

We define "dimension" as "a part or a feature or a way of considering something." Different dimensions shape the shared realities of evaluators and creative practices in different ways; they frame what evaluators are looking for as well as what is made visible about creative practices. A useful metaphor is the Buddhist parable of the blind monks and the elephant described in the *Tittha Sutta*, encountering different parts of the elephant, different individuals unfamiliar with it might describe it as a broom, a post, the pole of a plow, or a granary, only grasping one dimension of the creature (Thanissaro Bhikkhu 2012). So how would someone intimately familiar with the elephant as a creature use its various dimensions to describe it to those unfamiliar with it? We are also reminded of the way alien beings in the Lovecraftian horror tradition (Gibson 2022) are described by pointing out contrasting features to create both a composite image and a sense that something is being described that is altogether stranger than the sum of its parts.

There are ontological politics at play here, the politics of who gets to determine what is considered real and valuable and what gets ignored, and becomes or remains invisible (Escobar 2020). And what is "real" helps frame what is possible as well: what possibilities can be imagined based on what is understood to be the present. How do colonial, hyper-capitalist, and patriarchal systems acknowledge and dismiss entire dimensions of shared realities? This means that processes that allow those who are not in power to begin to structure realities on their own terms open up shared understandings of the real and the possible (Escobar 2020). We believe the dimensions framing can support the ontological agency of those around creative practices (Vervoort et al. 2015), and have potential for transformative reframings of existing ways of thinking and being.

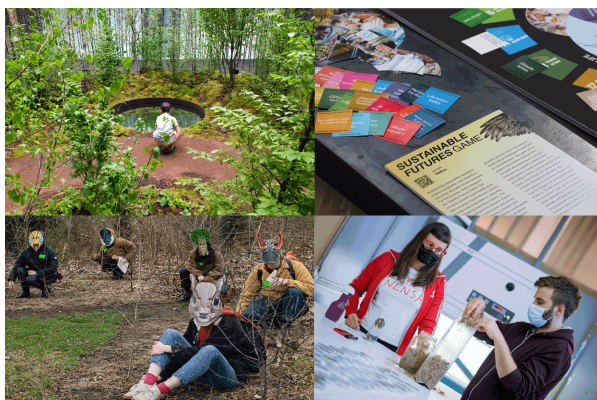
Fig. 1. The development process of the 9 dimensions. Each phase represents an iteration between activities with creative practitioners, interdisciplinary researchers, and funders and policy makers. The exception is the deriving of the 61 dimensions, because starting the scoping of the tool with the creative practitioners was seen as important.



Finding dimensions across creative practices

To open up the plurality of dimensions relevant to creative practices in transformation contexts, we first conducted a pilot series of structured interviews with four major CreaTures partners responsible for experimental productions using an interview method based on Vervoort et al. (2012). This interview method was focused on identifying dimensions relevant to the creative practitioners involved. These four partners were selected for the prototyping phase because they were the first to get started in the overall project, and were organizing the largest projects in terms of scope. The four CreaTures partners and their experimental productions (see Fig. 2) were the following (with links to the project pages with more elaborate descriptions and visuals embedded):

Fig. 2. Four CreaTures partners and their projects were involved in the prototyping of the 9 Dimensions tool. Top left: Invocation for Hope by Superflux (photo by Stefan Lux). Top right: Sustainable Futures Game by Hellon (photo by Savanna Vize). Bottom left: The Treaty of Finsbury Park 2025 by Furtherfield (photo by Furtherfield). Bottom Right: MyCoBiont by Kersnikova (photo by Hana Marn).



- Superflux, a design and experiential futures company leading two CreaTures experimental productions. The first is Invocation for Hope (Superflux 2021a), an interactive, experiential installation featuring burnt woodland remains as well as live trees set at the 2021 Vienna Biennale. The second is Refuge for Resurgence (Superflux 2021b), an installation focused around a multi-species dinner table, which has been part of a number of collections across Europe in 2021 and 2022.
- Furtherfield, an organization producing experimental and experiential futures work, and responsible for another CreaTures production: the live and on-line multi-species live action role playing game (larp) “The Treaty of Finsbury Park 2025” (Furtherfield 2022). This larp focuses on people playing ambassadors for various species in Finsbury Park in London.
- Hellon, a design and futures company responsible for the CreaTures experimental production the Sustainable Futures Game (Hellon 2021). This game provides a framework for structured, playful scenario development among its players, in the context of the Sustainable Development Goals.
- The Kersnikova Institute, an organization supporting experimental bio-art projects. Kersnikova was responsible for two CreaTures productions: reProductive Narratives (Smrekar et al. 2021), using lab work and artistic metaphor to describe social phenomenologies related to the recognition and appreciation of the female body as a production facility of new life; and MyCoBiont (Kersnikova 2022), a co-creative bio-art project focusing on mycelium and contained ecosystems.

Two participants per partner organization participated. In this process, consisting of three 1- to 2-hour interviews per experimental production, we asked creative practitioners to first describe, in detail, the material and conceptual history of their creative practice, as well as a story about what they hoped for the

future. Once these rich stories of the past, present, and future were mapped out using digital post-its, we went over them again together. For every important moment, idea, or shift in the practice, we asked, “What is the term we can use to understand what is most important about this key point in your story?” The answers to these questions led to a term (“co-creating,” “learning”) chosen by the creative practitioners with help from the interviewers, that described a dimension in which the creative practice could be understood.

Through this extended interview process, the multidimensionality of creative practice as understood by creators became abundantly clear. In the context of a workshop with the CreaTures consortium, the dimensions identified by the four larger experimental productions were supplemented by dimensions considered relevant by the other experimental productions, leading to a total of 61 dimensions. These dimensions were then synthesized by the research team into nine sets of two similar terms (or 18 in total) for a draft version of the tool. The clustering of these dimensions was co-determined by noting which dimensions described by the creative practitioners led to the most discussion and description of their own work. The reason to keep two similar terms was to keep the draft tool conceptually open while it was being tested with user groups. The process eventually led to nine final dimensions, but throughout the testing of the tool, space was given for much iteration and discussion about the specific scoping and phrasing of each dimension.

Testing and developing the draft tool

Once the first outline of the 9 Dimensions tool was created, a number of parallel, iterative testing and development processes were conducted, connected to different user groups over around 12 months of development by the authors. This development process aimed to (a) connect each dimension to sustainability transformations and (b) determine the framing and level of detail needed for the content connected to each dimension according to different user groups.

1. A research process was begun by the authors to investigate how each identified dimension connected to societal transformations, and how it could be translated to more specific questions and indicators. Different relevant literature was brought in depending on the dimension, including sub-domains of sustainability science, futures studies, sociology, anthropology, human geography, psychology, media studies, and more. Three small workshops with researchers across sustainability and creative practice and design were conducted to provide feedback on the tool.
2. The tool was field-tested on all 20 CreaTures experimental productions as an evaluative interview method and data structuring tool to help understand how the experiments played out across multiple dimensions, while understanding and improving the tool itself based on feedback. These interviews were conducted with creative practitioners where possible (in 12 cases) or with researchers who had been closely involved in the creative practice (in 8 cases).
3. Interviews with five policy makers/funders, a workshop with 35 participants in the European Commission system in

culture and sustainability domains, and another workshop with 10 funders/policy makers were organized to investigate the relevance of the tool and to collect suggested changes.

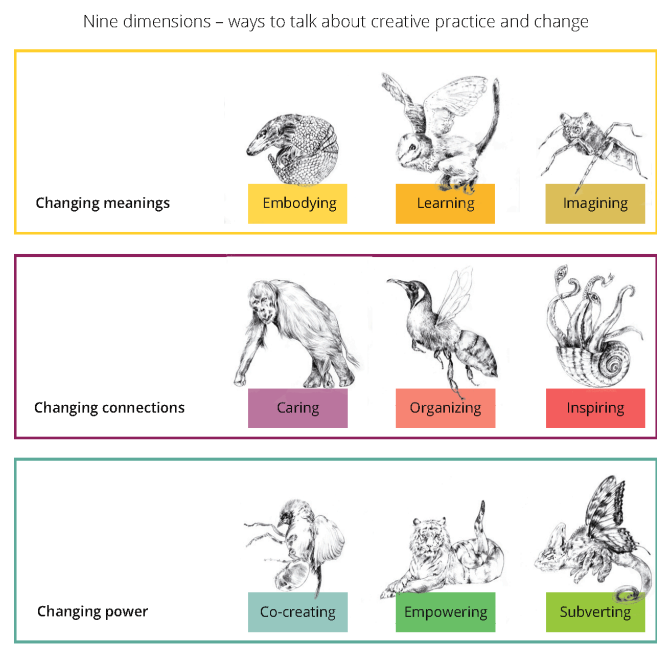
4. The tool was also tested and discussed with an audience made of a mix of these user groups at the CreaTures Festival in Seville, Spain.

The 9 Dimensions tool: structure

Here, we describe the 9 Dimensions tool as it emerged from the process described above. This version of the tool can be found online as part of the CreaTures Framework that makes insights from the CreaTures project accessible to practitioners, researchers, policy makers, and funders (Vervoort et al. 2023b). Each dimension is not meant to be understood as a single indicator or target, but rather an entire aspect of a shared reality that can be investigated and reflected upon. Figure 3 shows the main outlines of the tool: 3 categories of change each covering three dimensions: changing meanings (embodying, learning, imagining); changing connections (caring, organizing, inspiring); and changing power (co-creating, empowering, subverting).

The choice to structure the 9 dimensions along these three categories of change is a response to a number of iterations and feedback moments about the degree of structure that should be provided around the dimensions. Many potential users appreciated the open character of the 9 dimensions, but there was a desire, especially among funders, for some minimal structuring beyond a simple presentation of dimensions. The three categories were proposed by the authors and then tested further with the user groups.

Fig. 3. The 9 Dimensions tool: visual summary. Creature illustrations by Milja Komulainen. Visual design by Margot Stoete.



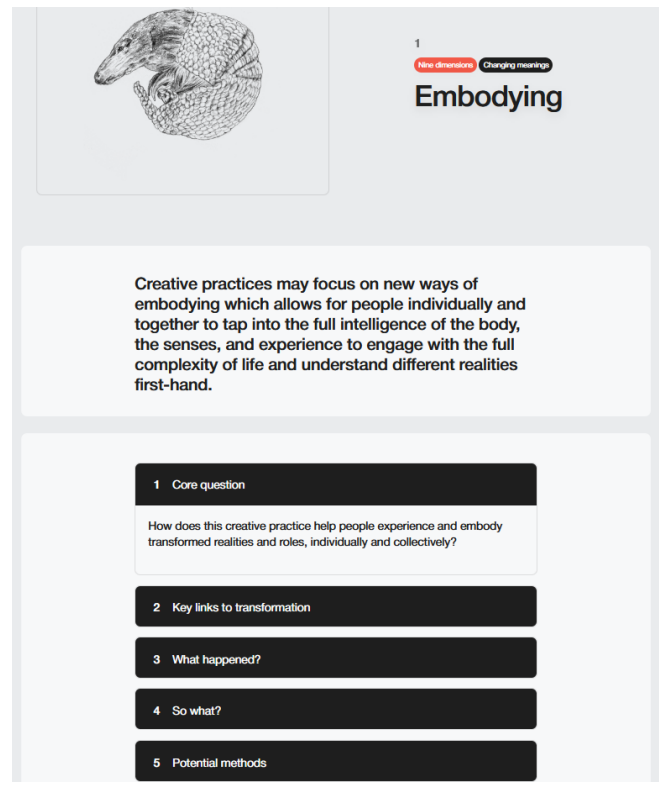
The selection of the dimensions acted as a boundary process for much transdisciplinary exchange. The final titles for each dimension were often chosen to position each dimension in relationship with sustainability transformations: “Embodying” because of a recognized need to forefront embodiment in the sustainability transformations literature. “Learning” was selected as the term to cover this dimension because it allowed for the connecting of many disciplines. “Imagining” was selected over other terms like “storytelling” and “myth making” because the literature connected to these terms would be too prescriptive and narrow. “Caring” was originally paired with “inclusion” but this pairing was dropped because inclusion was considered by practitioners especially to be very easily instrumentalized and coopted. Caring, by contrast, has a rich diversity of literature connected to it. “Organizing” was originally paired with “relating” but between organizing and caring, relating was considered too broad and less necessary. “Inspiring” was used rather than “scaling” as an overarching term, although scaling literature plays a major role in our description and is connected to sustainability literature. This was done because “inspiring” captures the emotional elements of the wider adoption of creative practices and allows for a use of this dimension by those not familiar with scaling concepts. “Empowering” was considered more comprehensive than more limited terms like “platforming.” “Subverting” was the subject of much discussion. Subversion has very different meanings in different fields and domains: it can be relatively benign (such as subversive knitting practices [McGovern 2022]) or have violent connotations (such as subversion of the Mexican state by drug cartels [Schedler 2014]). Ultimately, however, subversion is the most accurate term for the power of creative practice to help dismantle current systems (see Light 2022 for a fuller discussion), and we considered its controversial nature useful for the opening of dialogues.

To provide a visual creative resonance, each of the 9 dimensions was visualized as a fantastical creature by artist Milja Komulainen. Milja also created a “meta-creature” that combines all 9 dimensions/creatures into one friendly but hard to grasp Lovecraftian being, as per the theory section on dimensions (Fig. 4). This meta-creature was created to help clarify that creative productions are an often complex mix of the different dimensions that are not separate in practice.

Fig. 4. The meta-creature by Milja Komulainen, illustrating how creative productions are often a tangle of different dimensions that are useful to separate for evaluation but not separate in practice.



Fig. 5. The 9 Dimensions tool: layout of different sections on <https://creaturesframework.org/>, example: embodying.



Feedback across user groups highlighted the need for each dimension to be covered at different levels, allowing for users to determine their own level of detail. The full description of each dimension along with the elements described above can be found for each dimension on the 9 Dimensions tool page (see Fig. 5 for an example of this layout). For the purposes of this paper, the links between each dimension and sustainability transformations are presented here in an abbreviated fashion. The different elements are as follows:

1. The core question: what this dimension is helping to investigate. This is to provide more information and contextualization beyond the simple verb.
2. Key links between this dimension and societal transformation: why does this dimension make a difference, what do we know about it? This turned out to be a key section for each dimension. Non-researcher users (funders, policy makers, practitioners) pointed to the need to have a clear narrative, supported by research, as to the value of each dimension for sustainability transformations. This would be key to be able to design evaluations and reflections, and communicate about the dimensions to others. Researchers saw the development of this connection narrative as key to developing a research agenda mapping creative practices to sustainability transformations.
3. Descriptive questions: what happened in a project in terms of this dimension? Our original intention was to develop indicators for each dimension, but when we applied the

dimensions in practice, each creative practice experiment turned out to be so different that specific indicators did not turn out to be useful. Moreover, creative practitioners indicated that the framing of indicators would only be of limited use to them, and that questions would be more practical. Descriptive questions help keep track of what happened in and around the creative practice.

4. So-what questions: how do we know what happened mattered? And for whom? This category of questions came up as important during feedback rounds, to separate from the descriptive questions to create a space for questions that more explicitly investigated the values underlying the creative practice and its effects, questions about the politics of engaging different audiences or participants, and longer term impacts.
5. Potential methods to research this dimension. Some basic recommendations for methods that could be used to research each dimension.
6. Research background: a longer version of the “links to transformation” text, with full references to the relevant literature. This was considered useful for users interested in the academic support for the links between each creative practice dimension and sustainability transformations.

Linking each dimension to sustainability transformations

The following are abbreviated versions of how each dimension links to theory. The full versions can be found [here](#).

Changing meanings:

- **Embodying:** Creative practices may focus on new ways of embodying which allows for people individually and together to tap into the full intelligence of the body, the senses, and experience to engage with the full complexity of life and understand different realities first-hand (Bentz et al. 2022). Embodiment allows for a much more diverse set of ways of knowing and experiencing the world to be shared, giving it an important role in allowing for a connection to perspectives and ways of being that are normally ignored in a rationalistic world (Heras and Tàbara 2014). Embodiment goes hand in hand with situatedness in contexts: the body and its experiences are inherently intertwined with environmental, cultural, and social factors (Bladow and Ladino 2018). Embodiment is intimately connected to metaphors and meaning: the body can be used as a way to ask questions, connect with ideas and theoretical concepts (Heras et al. 2021). At the group level, shared embodiment allows for full emotional communication between people, through body language, embodied speech, and touch. This allows for the generating of shared emotional energy (Summers-Effler 2002) and effective interaction rituals through physical co-presence, a joint focus of attention, and a shared mood. This connection and emotional energy are key drivers of transformative change. They can lead to new values, morals, and symbols of social relationship (Collins 2004), building blocks of sustainability transformations.
- **Learning:** Learning that leads to changing basic assumptions, worldviews and knowledge about the world, and change processes is considered part of one of the deepest

leverage points for sustainability transformations: shaping the goals and functioning of systems (De Witt 2013). Complex sense-making processes happen naturally when the public engages with creative practice (Foreman-Wernet and Dervin 2017). Reflection is key to learning around art and creative practice because experiences change understanding through reflection (Mayer et al. 2014). Moyer and Sinclair (2020) describe how learning can be the basis for personal transformations, which occurs when the learner evaluates and reflects on what they have learned through communicating, experimenting, and absorbing knowledge, relating this to more fundamental assumptions and understandings (Jaakkola et al. 2022). Social learning is also a crucial ingredient: collectively, humans learn from each other through communication, through watching each other's behavior, through collective problem solving (Reed et al. 2010). Relational and collective learning can then be passed on to others. Around key societal issues, learning through collectivity, shared acceptance, and social connection can allow people to express their hidden concerns, externalize their problems, and together develop a shared critical consciousness that sees societal problems as structural and in need of change (Summers-Effler 2002). Connected individual and collective learning processes change the orientations required for action on sustainability transformations (Kristjansson et al. 2014).

- **Imagining:** Those seeking to change societies imagine better futures to achieve, unwanted futures to avoid, and often both (Milkoreit 2017). Imagined futures, present day life, and remembered pasts are completely entangled in practice, both individually and collectively (Bendor 2018, Bendor et al. 2021). Groups, organizations, and communities drive societal change because they reflect and re-interpret memories of the past along with their experiences of the present and their imagining of the future (Hawlina et al. 2020). When people see or experience new ways of being or doing in action that they did not consider possible before, this in turn opens up new imaginative possibilities (Raudsepp-Hearne et al. 2020). Art and creative practices have a special role to play in expanding imaginations (Light et al. 2019), because they are relieved of the duty of coherence (Law 2003); they can be associative and open in meaning. When visions, images, and narratives of the future created by individuals or small groups are cultivated through reflection and re-articulation (Mattelmäki et al. 2011), they may attract more and more people, resources, and other forms of support. They may end up as “imaginaries,” images of the future that are supported by institutions, and that are publicly performed again and again (Jasanoff and Kim 2015, Milkoreit 2017). Imaginaries help create the horizons of what societies can imagine. So, if imaginaries are extended or new imaginaries arise, new imaginative spaces can open the possibility for new ways of being and doing (Moore and Milkoreit 2020, Davelaar 2021). Through institutional embedding, collective support, and public performance, imaginaries become increasingly intertwined with institutional change, shifts in public perceptions, and systems transformations (Jasanoff and Kim 2015).

Changing connections:

- **Caring:** Care can relate to ethics, emotions, and to practices and actions, and all of these elements of care are intertwined (de la Bellacasa 2012). Caring practices can be a tangible manifestation of interdependence and relationality (Warren 2000, Moriggi et al. 2020a). Such caring practices can become sites of “ethical creativity,” showing how every day actions have political potential. Caring practices can show how the personal and the communal or collective are ethically connected. Practices of caring can foster relational “response-ability” (Moriggi et al. 2020a). Paying caring attention helps focus people’s intentions, and through those intentions, can help focus actions (Wells and Gradwell 2001). Care can shape individual and collective imaginations and open up new possibilities; and care and imagination together can extend who and what is included as worthy of care, from other humans to non-human species (Moriggi et al. 2020b). Between humans, care helps provide the emotional energy people need to exert their agency in the world, individually and collectively (Summers-Effler 2002). This way, care can help create the space for emotions and struggles that are normally not recognized or accepted. Creative practices and art offer a unique possibility for care and recognition around such emotions and experience. Care facilitates the trust and safety to help such a transformation to get the space to emerge (Moriggi et al. 2020a).
- **Organizing:** Art and creative practice can help express intentions, values, and emotions (Nguyen 2019). As a result, creative practice can become the object of a group commitment, fueled by emotional engagement (Jasper 2011). Accordingly, many social movements use art and creative practice as a key element of their engagement strategies (Beautiful Trouble 2022, Rodriguez-Labajos 2022). Understood through the lens of rituals, shared creative practice experiences can create shared emotional energy, new symbols of social relationship, group solidarity, and new standards of morality (Collins 2004). These outcomes can in turn form the basis for further organization among participants involved; as well as the basis for further high quality rituals. Collaborative and community-based creative practices with participatory components have been shown to support dialogue and social learning, and to have the potential to build collaboration in communities (Chandler et al. 2014). Creative practice can generate reflection, dialogue, the exploration of alternatives, and the clarification of values needed as a basis for organizational change that supports sustainability transformations (Golańska and Kronenberg 2020).
- **Inspiring:** Art and creative practice have the potential to reach, inspire, and activate people and organizations beyond those involved directly in their practice. This can happen both through people directly engaging with the creative practice itself or through secondary representations and communications. Inspiration can be understood as a combination of (1) providing emotional energy for those who engage in the creative practice (Summers-Effler 2002), which fuels and is fueled by (2) opening new spaces for communication, imagination, and action through new ideas, imagery, stories, and more (Galafassi et al. 2018). New

discourses, imaginaries, and “communities of meaning” can develop (Fine 1995, Milkoreit 2017). Small group interactions and personal relationships are key to inspiration (Fine 1995, Summers-Effler and Kwak 2015). Scaling is a relevant literature connecting inspiration to sustainability transformations. Creative practices can “scale out”: they are repeated in some (adapted) form elsewhere (Lam et al. 2022). Creative practices can “scale up” (Lam et al. 2022): higher level organizational and institutional structures change to support the flourishing of this kind of creative practice. Creative practices can also “scale across”: their methods and approaches are applied in other contexts (Mitlin 2021). Finally, creative practices can “scale through”: the skills, capabilities, and lessons developed through the creative practice spread and are used to engage with other issues (Mitlin 2021).

Changing power:

- **Co-creating:** Co-creation changes creative practices in terms of breadth, depth, and quality (Moser 2016, Heras et al. 2021). Co-creation allows for creative practices to include the perspectives and concerns of diverse and perhaps under-represented groups to be part of the creative process, and possibly in the process design itself (Vines et al. 2013). Furthermore, co-creation allows for the generation of new ways of seeing and understanding the world, which is beneficial from the perspective of knowledge and understanding (Stirling 2008, Thomas and McDonagh 2013, Akama et al. 2020). Pre-existing notions about the world are challenged, integrated, and altered (Hakio and Mattelmäki 2023). Finally, co-creation increases the possibility that real solutions and concrete activities might emerge from the co-creative process, beneficial from an action perspective (Stirling 2008). Co-creation can help develop the agency, ownership, and control of all involved and a greater understanding of others, their values, and knowledge systems (Nicholas et al. 2019). It can also help build collaborative skills and allows different people to share their skills across backgrounds and disciplines. Through active co-creative work, sensitivity can be developed toward important issues (Lee et al. 2018). New relationships can be formed through co-creation (Vines et al. 2013). Co-creation is crucial for shaping democratic and legitimate sustainability transformations (Stirling 2008).
- **Empowering:** Empowerment can be understood as an increased sense of impact, competence, meaning, and available choices (Avelino 2017). Creative practices have the potential to help empower individuals and groups who are in marginalized positions and/or who champion radical and novel perspectives. The two most central ways to understand the potential of creative practices is through (1) discursive power and (2) emotional energy. Discursive power is the power of shaping collective expressions of meaning (Avelino 2021). This includes the way the media, politics, the public, educational systems, and others speak and visualize key issues. Creative practice can draw attention and emotions to new metaphors (Lakoff and Johnson 1980) and framings of societal issues (Rodriguez-Labajos 2022). Existing art can

also be mobilized for political means, telling new stories and using new frames around it (Milkoreit 2019). Creative practices can bring together new groups of people, helping to establish new networks that can be a source of power (Nguyen 2019, Hawlina et al. 2020). Creative practices generate emotional energy; special attention should be given to how anger breaks people out of disempowerment (Summers-Effler 2002). Material power and resources (including access to spaces and institutional support) play an important supportive role (Baumann 2007). Finally, creative practices can also jump on external opportunities, societal events and uproar, important political decision moments, and so on, to create empowerment (Baumann 2007). Understanding how creative practices lead to empowerment is crucial because shifts of power are at the heart of sustainability transformations (Avelino 2021).

- **Subverting:** The subversion, disruption, and unmaking of current unsustainable societal structures, regimes, and institutions is a crucial component of transformations toward more sustainable futures (Light 2022). This subversion fundamentally involves power shifts. This way, subversion can be understood as a type of unmaking that is connected to creative practice and the arts (van Oers et al. 2021). Unmaking here refers to the dismantling of current systems, from the individual level (internalized ideologies and values) all the way to the global level (Feola et al. 2021). Processes of unmaking involve both symbolic and material deconstruction. Symbolic deconstruction interacts with material deconstruction in ways that are mutually reinforcing. Subversion can be understood as key to symbolic deconstruction. Creative practices can subvert by making everyday realities less familiar, and by making the accepted unacceptable (Light 2022, Rutting et al. 2022). Subversive practices that challenge, invert, defamiliarize, and make absurd present realities require courage. Creative practices can provide the individual and collective emotional energy and hope needed to develop a shared critical consciousness, and following this, to engage with actual subversion (Summers-Effler 2002). Playfulness is key here; playful creative practices can loosen societal burdens, values, norms, and power structures. Playful subversion can critique and make absurd societal practices that are considered “just the case” (Vervoort 2022). Moreover, there is a pleasure in subversion that can further generate emotional energy, and a subversion in pleasure (Brown 2019). In short, subversion represents the unique manner in which the arts can contribute to the symbolic unmaking of unsustainable systems.

Applying the 9 Dimensions to 20 experimental productions

The 9 dimensions were applied to all CreaTures experimental productions in a process that involved interviews with practitioners and researchers, working through different iterations of the questions. We focused on understanding what the initial intentions were of the creative practitioners, not only in terms of each dimension, but also in terms of what dimensions were even considered to be relevant, and compared and contrasted this with any data and reflections by participants, visitors, and others about the experimental production. The 9 dimensions

functioned as a data coding and sorting scheme to organize different quotes, data points, and other materials across the different dimensions, after which we summarized the key points from the data in each dimension. This approach allowed the research team to arrive at insights about how reality differed from expectations around each experimental production, and, in turn, where the most significant results could be found across the different dimensions. We present insights per dimension here, providing an example from the set of 20 experimental productions. For more examples per dimension, see the [dedicated page](#) for this analysis on the CreaTures Framework website.

1. Changing meanings

Many CreaTures projects focused on changing meanings through a tightly interconnected dynamic of embodiment, learning, and imagining.

Embodiment

Embodiment played an important role in many CreaTures projects. Many experimental productions combined embodied experience (touch, making, etc.), an engagement with role and identity and place/contextualization, in order to engage with the full range of possibilities of embodiment. Embodiment also became the experiential grounding and provided richness for many of the other dimensions. For example, the Invocation for Hope (Superflux 2021a) installation invited people into a burnt but secretly alive indoor woodland, and evoked many reflections on new embodied experiences among participants, describing complex feelings about the desolation and aliveness they were immersing themselves in.

Learning

In terms of learning, the most powerful potential among CreaTures projects seems to be learning couched in other dimensions: embodying, imagining, relating, and so on. Furthermore, collective and relational learning seem to be powerful among experimental productions. Finally, the repetition and the learning of new skills appears as an important pathway to change. A powerful example is The Hologram (Thornton 2020, Thornton et al. 2021, Houston et al. 2022), a project where people embody different types of support for another person as an act of anti-capitalist resistance. Participants reported discovering a whole new relational skillset through this practice.

Imagining

Across the experimental productions, shared and relational imagining stands out. People reflected on the power of making and telling stories together about situated experiences and insights. Another common theme with high potential is the shared imagining and experimenting with new institutions, practices, and other patterns of meaning that represent transformative change. In the Treaty of Finsbury Park 2025 (Furtherfield 2022), imagination is really central. Players work together to imagine festival activities and other shared plans that help support and foster the different species in the park. These plans have a fictional imaginative basis but their intent is to serve as inspiration for real action.

2. Changing connections

Changing meanings was in turn strongly linked, but also sometimes contrasted, with changing connections:

Caring

Several experimental productions focused on care as a force for transformational change. The way care reconfigures what it means to relate and to be in the world appears to have powerful potential for wider change. The focus on care brings important ethical, relational, and emotional elements to creative practices. For example, the project *View from the Window* (Miller 2022) involved an urban community around an art space in developing new relationships to that space and to their community, fostering a sense of connectedness and relationality among people living in precarious conditions and included such festive activities as community picnics in the space. The fact that this project was continuous over a longer period of time strengthened possibilities of caring and relating.

Organizing

Some experimental productions were more focused toward creating and stimulating structures for collaboration. Although they were typically effective at this core function, they engaged comparatively less with experiential and embodied elements. Conversely, there is potential for more organizational activity and structures of collaboration beyond the immediate activity among the more “embodied” practices.” Several experimental productions did combine both. For example, *Commonspoly* (ZEMOS98 2020) is a commons-focused version of *Monopoly*, helping people experiment with commons thinking through play and discussion. What makes *Commonspoly* a strong example of organizing is the fact that the project has actively focused on developing alternative networks for the game’s production and distribution, involving a widely spread network of people as ambassadors in this process.

Inspiring

A number of the *CreaTures* experimental productions were expressly set up with networking at the core, focused on replicating and adapting approaches and methods, or adapting and drawing on previous work. This ecological and networked design appears to have strong potential for stimulating change because it appears to reach many different groups and settings. An example is the *Open Forest* (Botero Cabrera et al. 2022, Open Forest Collective 2022, Dolejšová et al. 2023) project, which took participants out in the woods for unscripted investigations and explorations, fostering tactile and experiential relationships with the environments people were exploring. This project was designed as a “feral method” that could be adapted by others, and this method focus allowed it to spread (Dolejšová et al. 2024).

3. Changing power

Finally, experimental productions had very different ways of engaging with changing power:

Co-creating

Co-creating almost always appeared as a powerful approach in terms of transformative possibilities because it gives participants opportunities for engaging with the creative practice across all other dimensions, and contributes to a sense of agency (Clarke et al. 2016), encouraging co-ownership. The *Baltic Sea Lab* (Lohmann and Department of Seaweed 2021) is a project that focuses on experiential engagement with sea ecology through sea visits, dives, encounters with sea weed, installations, and more. It was designed as a growing co-creative network across creative practice and science.

Empowering

Projects that focused on developing new skills, ways of relating, and on co-creating tended to have the most potential for empowering. This, however, raises important questions about who is empowered, who is included in the practice? Whose voices are heard and brought to the forefront? Empowerment in ways that shift power are often a matter of longer term effects and potential. The community project *Yarmouth Springs Eternal* (Rudd 2022) empowered people with lived experience of migration, homelessness, mental health, and additional challenges by giving them the tools and space to plan and facilitate community arts sessions in their own right. Participants reported a growing sense of confidence through this process.

Subverting

Experimental productions that were subversive, were mostly subversive in fairly gentle ways, subverting dominant ways of working, relating, and understanding. These types of subversion can be quite effective and powerful, and sometimes even emerged from frustration with more overt, hostile subversion and its limitations among the creative practitioners. For example, *reProductive Narratives* (Smrekar et al. 2021) focused on subversion by using menstrual blood and lab methods as a basis for artistic expression. The project aimed to subvert perspectives and understandings of the politics of female bodies and reproduction.

DISCUSSION AND CONCLUSIONS

The 9 Dimensions tool was created to respond to a need shared by creatives, researchers, policy makers, and funders to reflect and speak meaningfully about the link between creative practices and sustainability transformations. The research supporting the tool also connects diverse literatures linked to different dimensions of creative practice to sustainability transformations, and seeks to open inter -and transdisciplinary exchange in this way.

Reflections on the 9 Dimensions tool in the context of transdisciplinarity

Which dimensions to engage with?

The 9 Dimensions can be used to organize and interpret data, for instance, from interviews, focus groups, questionnaires, or observation notes. It is important to note that the 9 Dimensions were not developed as an assessment that needs to be completed for every creative practice. A creative practice that does not engage with all nine dimensions is not worse than a creative practice that does so. This tool is very much meant to be used in a qualitative, contextualized, and reflective manner. Users might be interested in specific dimensions and not in others. However, we have found that it can be valuable to discuss creative practices or data associated with such practices in terms of dimensions that would not normally be the focus for those involved because new insights about how the practice operates in these dimensions might emerge. From a sustainability transformations perspective, it is particularly valuable to understand what happened through the course of the creative practice that was unexpected, and even happened in dimensions that were not really a focus for the creators, funders, and so on. This analysis might lead to a more inclusive account of the value of the creative practice, or it might spur insights for further creative exploration. Further, the range of intersecting and dynamic concerns expressed in these dimensions underlines the elusive nature of cultural

transformation, the need for recognition of multiple and even conflicting types of impact, and the non-linear nature of social change processes. Funders confirmed that they found the nine dimensions and their associated questions useful to discuss creative practices in ways that would otherwise not be highlighted.

Adapting the tool for different user groups

The 9 Dimensions tool was designed to open up and dimensionalize evaluations and reflections on creative practices and societal transformations, especially in a context of sustainability. It was developed using an iterative design process, exploring potential user journeys through the material, starting with creative practitioners and then testing and developing it further with funders, policy makers, and researchers. The tool was also developed for these four users, because it was clear that all of these groups should be involved in opening up the language around evaluation and impact. But this diversity of intended users posed a design challenge for the tool. It had to be accessible and flexible enough to be used by all groups, and to balance openness and structure. From feedback received by the different users, it seems like the tool just about strikes this balance. But there is certainly scope for more development and adaptation for each specific user group. [Impact Makers](#), a boundary organization developing tools for creative practitioners to reflect on their societal impact, commented on an early version of the 9 Dimensions tool that its multidimensionality could be overwhelming for creative practitioners. This comment was taken into account and partly led to a “click through” structure where the details of each dimension become available bit by bit. However, a more step-by-step guidance could be valuable for users, and work with Impact Makers has been initiated to realize this further development of the approach.

Using the 9 Dimensions to design projects, calls, and more

Though the 9 Dimensions were initially created for evaluation within the project and beyond, it was evident that they could also be generative. Users suggested that when creative practices are started or funding calls designed, the dimensions offer building blocks for a theory of change to help work out what is intended, and in what dimensions change is hoped for. For funding calls specifically, framing the focus of requested projects along some or all of these nine dimensions was understood to be valuable to allow creative practices to pursue different change pathways. Our understanding of this design potential benefited substantially from the transdisciplinary nature of the teams involved and we suggest would not have been visible without access to practitioners across the range of potential use cases.

Using the 9 Dimensions to analyze data

When creative practices are ongoing or completed, the 9 Dimensions can be used to organize and interpret data, for instance, from interviews, focus groups, questionnaires, or observation notes. One particular interest is understanding what happened through the course of the creative practice that was unexpected, or occurred in dimensions that were not an initial focus of the creators, in line with the openness of creative practice to evolving and learning from use situations. Although it might be valuable to organize observations, interviews, focus groups, questionnaires, and so on using the 9 Dimensions, we do not expect it to be used only in this way. From our experiences with

the CreaTures productions, it might actually be valuable to have unstructured, open data collection and use the 9 Dimensions as a coding scheme.

When creative practices are ongoing or completed, the 9 Dimensions can be used to organize and interpret data, for instance, from interviews, focus groups, questionnaires, or observation notes. Of particular interest again, is understanding what happened through the course of the creative practice that was unexpected, or occurred in dimensions that were not an initial focus of the creators. What is important to note is that though it might be valuable to organize observations, interviews, focus groups, questionnaires, and so on using the 9 Dimensions, this is not a requirement. From our experiences with the CreaTures projects, it might actually be valuable to have unstructured, open data collection and use the 9 Dimensions as a coding scheme.

Analysis across many projects: learning from 20 creative practice cases

Our analysis of the 20 CreaTures experimental productions enabled us to identify patterns, strengths and gaps across this entire set of projects. The qualitative nature of the analysis allowed us to maintain the specificity of each project, producing summative narratives about each project in terms of its relevant dimensions. It allowed us to produce general insights and recommendations for creative practices seeking to engage with societal transformations.

Overall, a conclusion emerges that creative practices with the most transformative potential combined (1) learning and imagining based in deep, situated embodiment with (2) many possibilities for networked growth, adaptation, and mutation of the practice by others. Overall, care stood out as a powerful dimension that theory and practice show as having strong transformative potential. Furthermore, co-creative approaches almost always seem to offer many benefits over less co-creative approaches, allowing participants to develop co-ownership, share ideas, develop relationships, and develop skills. Finally, empowerment and subversion were components of many of the experimental productions, but there was scope for more development about the “who” of empowerment, and about how challenging or subversive creative work should be.

Evaluation as imagination infrastructure: leverage points and ontological politics

At the start of this paper we argued that the evaluation of creative practices can itself be understood as a leverage point for sustainability transformations. Evaluation is a site of power and ontological politics: funders and policy makers determine what is real and realistic, what is good or impactful creative practice, shaping requirements for creative practitioners who try to respond to these framings from positions of comparatively low power. The 9 Dimensions tool is an explicit attempt to re-frame evaluations of creative practice based on the understandings of creative practitioners. Its multidimensional character aims to open up the space for dialogue between creative practitioners and other societal actors with a language that recognizes the many potential change pathways that link creative practice and sustainability transformations, while drawing on the framings provided by creative practitioners. The change mechanisms described that link each dimension to transformations can empower creative

practitioners, giving them ontological agency in their ambitions to stimulate sustainability transformations. On the side of funding and policy, the 9 Dimensions tool aspires to be part of new infrastructures that recognize and support more ways in which creative practice connects to sustainability transformations.

Opening up the research space on creative practices and transformations

The linking of the 9 Dimensions to different literatures turned out to be crucial. It is important to have a research-backed understanding of how each dimension actually relates to sustainability transformations. This is important for all involved in creative practice. Funders and policy makers want to understand what change through creative practice looks like. Creative practitioners benefit from having the research backing for change processes they might normally know intuitively. And researchers benefit from finding out about key research on change processes that they can engage with, test and develop, across disciplinary boundaries. The work draws on different knowledge traditions with different methodological and ontological starting points (from science, social science, humanities, and arts) and the dimensions go some way to making these commitments clearer.

Moreover, the 9 Dimensions open up a research agenda for creative practice in the context of sustainability transformations. Our conceptual focus was on the deep leverage points of shared meaning making, paradigms, imaginaries, values, and more, the symbolic (but very real) aspects of sustainability transformations (Davelaar 2021). In seeking to connect to relevant literature, we turned to sociology, anthropology, human geography, feminist and decolonial theory, scale theory, futures, design, imaginaries, discourse theory, linguistics, political science, and more. Some of this theoretical work is connected to sustainability research; some of it to creative practice research; but this literature is not often connected to both. Of special note has been the widespread utility, in our view, of sociological work on interaction ritual theory and its associated concept of emotional energy (Summers-Effler 2002, Collins 2004) as a theory that connects to many of our dimensions in terms of their capacities to stimulate change. Interaction ritual theory has not as yet been connected to the combination of creative practice and sustainability transformations, and there is much scope for development here. Speaking generally across disciplines, sociology offers some useful theory on change mechanisms, whereas humanities-based disciplines tend to offer a lot of context and richness, and disciplines like anthropology and decolonial research offer a groundedness in experienced realities and power dynamics. More generally we believe that our outlining of the 9 Dimensions can help frame further research into each of these dimensions, their interactions with other dimensions, and their links to transformations, both theoretically and in terms of empirical research.

Acknowledgments:

We would like to thank all the artists and authors of the CreaTures experimental productions for their enthusiastic engagement in the development and testing of the 9 Dimensions tool. We would also like to thank the policy makers and funders for their time and interest

in the development of the research. We are grateful for the support of our research communities in our development process. This article was supported by the CreaTures project. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 870759. The Horizon 2020 programme takes no accountability for the views expressed in this article. This article was partly supported by the Dutch Research Council (NWO) who funded the NWO Vidi project ANTICIPLAY (project number VI. Vidi.195.007).

Data Availability:

All data used in the project can be found in references to the CreaTures project website, referenced in the text.

LITERATURE CITED

- Akama, Y., A. Light, and T. Kamihira. 2020. Expanding participation to design with more-than-human concerns. Proceedings of the 16th Participatory Design Conference 1:1-11. <https://doi.org/10.1145/3385010.3385016>
- Avelino, F. 2017. Power in sustainability transitions: analysing power and (dis)empowerment in transformative change towards sustainability. Environmental Policy and Governance 27:505-520. <https://doi.org/10.1002/eet.1777>
- Avelino, F. 2021. Theories of power and social change. Power contestations and their implications for research on social change and innovation. Journal of Political Power 14:425-448. <https://doi.org/10.1080/2158379X.2021.1875307>
- Bai, X., S. Van Der Leeuw, K. O'Brien, F. Berkhout, F. Biermann, E. S. Brondizio, C. Cudennec, J. Dearing, A. Duraiappah, M. Glaser, A. Revkin, W. Steffen, and J. Syvitski. 2016. Plausible and desirable futures in the Anthropocene: a new research agenda. Global Environmental Change 39:351-362. <https://doi.org/10.1016/j.gloenvcha.2015.09.017>
- Baraona, E., C. Flores, F. De La Vega, S. Eclectic, M. Burghardt, J. H.-j. Choi, F. G. G. Gil, and CreaTures. 2023. Messages in a bottle: a CreaTures experiment. <https://creaturesmessages.org/>
- Barbrook-Johnson, P., A. Proctor, S. Giorgi, and J. Phillipson. 2020. How do policy evaluators understand complexity? Evaluation 26:315-332. <https://doi.org/10.1177/1356389020930053>
- Baumann, S. 2007. A general theory of artistic legitimation: how art worlds are like social movements. Poetics 35:47-65. <https://doi.org/10.1016/j.poetic.2006.06.001>
- Beautiful Trouble. 2022. Tactics. <https://beautifultrouble.org/toolbox/tactic>
- Belfiore, E. 2002. Art as a means of alleviating social exclusion: does it really work? A critique of instrumental cultural policies and social impact studies in the UK. International Journal of Cultural Policy 8:91-106. <https://doi.org/10.1080/102866302900324658>
- Belfiore, E. 2009. On bullshit in cultural policy practice and research: notes from the British case. International Journal of Cultural Policy 15:343-359. <https://doi.org/10.1080/10286630902806080>

- Belfiore, E. 2022a. Is it really about the evidence? Argument, persuasion, and the power of ideas in cultural policy. *Cultural Trends* 31:293-310. <https://doi.org/10.1080/09548963.2021.1991230>
- Belfiore, E. 2022b. Who cares? At what price? The hidden costs of socially engaged arts labour and the moral failure of cultural policy. *European Journal of Cultural Studies* 25:61-78. <https://doi.org/10.1177/1367549420982863>
- Bendor, R. 2018. Imagination. Pages 129-164 in *Interactive media for sustainability*. Palgrave Macmillan, Cham, Switzerland. https://doi.org/10.1007/978-3-319-70383-1_5
- Bendor, R., E. Eriksson and D. Pargman. 2021. Looking backward to the future: on past-facing approaches to futuring. *Futures* 125:102666. <https://doi.org/10.1016/j.futures.2020.102666>
- Bentz, J., L. Do Carmo, N. Schafenacker, J. Schirok, and S. D. Corso. 2022. Creative, embodied practices, and the potentialities for sustainability transformations. *Sustainability Science* 17:687-699. <https://doi.org/10.1007/s11625-021-01000-2>
- Bladow, K., and J. Ladino. 2018. *Affective ecocriticism: emotion, embodiment, environment*. University of Nebraska Press, Lincoln, Nebraska, USA. <https://doi.org/10.2307/j.ctv75d0g8>
- Blythe, J., J. Silver, L. Evans, D. Armitage, N. J. Bennett, M.-L. Moore, T. H. Morrison, and K. Brown. 2018. The dark side of transformation: latent risks in contemporary sustainability discourse. *Antipode* 50:1206-1223. <https://doi.org/10.1111/anti.12405>
- Botero Cabrera, A., M. Dolejšová, J. H.-j. Choi, and C. Ampatzidou. 2022. Open forest: walking with forests, stories, data, and other creatures. *Interactions* 29:48-53. <https://doi.org/10.1145/3501766>
- Brown, A. M. 2019. *Pleasure activism*. AK, Edinburgh, UK.
- Casal, A. N. 2021. It begins with us: on why our embodied experiences matter in the dis/appearance of worlds. *European Association for the Study of Science and Technology (EASST) Review* 40(1).
- Caust, J. 2003. Putting the “art” back into arts policy making: how arts policy has been “captured” by the economists and the marketers. *International Journal of Cultural Policy* 9:51-63. <https://doi.org/10.1080/1028663032000089723>
- Chandler, L., C. Baldwin, and M. Marks. 2014. Catalysts for change: creative practice as an environmental engagement tool. *Leonardo* 47:506-507. https://doi.org/10.1162/LEON_a_00825
- Clarke, R., J. Briggs, A. Light, and P. Wright. 2016. Situated encounters with socially engaged art in community-based design. Proceedings of the 2016 ACM Conference on Designing Interactive Systems. Association for Computing Machinery, Brisbane, Queensland, Australia. <https://doi.org/10.1145/2901790.2901882>
- Collins, R. 2004. *Interaction ritual chains*. Princeton University Press, Princeton, New Jersey, USA. <https://doi.org/10.1515/9781400851744>
- Cox, J., and P. Barbrook-Johnson. 2021. How does the commissioning process hinder the uptake of complexity-appropriate evaluation? *Evaluation* 27:32-56. <https://doi.org/10.1177/1356389020976157>
- Creatures. 2023a. The CreaTures framework. CreaTures. <https://creaturesframework.org>
- Creatures. 2023b. CreaTures website. CreaTures. <https://creatures-eu.org/>
- Creatures. 2023c. Laboratory: how might artistic and transformational aspirations and aims be aligned in practice? CreaTures. <https://creatures-eu.org/laboratory/>
- Creatures. 2023d. CreaTures co-laboratory catalogue. M. Dolejšová, editor. CreaTures. <https://doi.org/10.5281/zenodo.7525506>
- Creatures. 2023e. Observatory: What are the specific qualities of transformational creative practices? CreaTures. <https://creatures-eu.org/observatory/>
- Creatures. 2023f. Evaluation: how do we measure and talk about the impact of transformational creative practices? CreaTures. <https://creatures-eu.org/evaluation/>
- Creatures. 2023g. Engagement: how might we encourage and support future transformational creative practices from the individual to infrastructural level across Europe and beyond? CreaTures. <https://creatures-eu.org/engagement/>
- Davelaar, D. 2021. Transformation for sustainability: a deep leverage points approach. *Sustainability Science* 16:727-747. <https://doi.org/10.1007/s11625-020-00872-0>
- Davis, J., K. Mengersen, S. Bennett, and L. Mazerolle. 2014. Viewing systematic reviews and meta-analysis in social research through different lenses. *SpringerPlus* 3:511. <https://doi.org/10.1186/2193-1801-3-511>
- De La Bellacasa, M. P. 2012. ‘Nothing comes without its world’: thinking with care. *Sociological Review* 60:197-216. <https://doi.org/10.1111/j.1467-954X.2012.02070.x>
- De Witt, A. 2013. *Worldviews and the transformation to sustainable societies. An exploration of the cultural and psychological dimensions of our global environmental challenges*. Dissertation. Vrije Universiteit Amsterdam, The Netherlands.
- Dewinter, H., K. Rutten, and L. Bradt. 2020. Policy attachment in the arts: the underlying agendas of arts’ social role. *Cultural Trends* 29:96-111. <https://doi.org/10.1080/09548963.2020.1763780>
- Dolejšová, M., C. Ampatzidou, L. Houston, A. Light, A. Botero, J. H.-j. Choi, D. Wilde, F. Altarriba Bertran, H. Davis, F. Gil, and R. Catlow. 2021. Designing for transformative futures: creative practice, social change and climate emergency. C&C '21: Proceedings of the 13th Conference on Creativity and Cognition, June 22-23, Italy. Association for Computing Machinery, New York, New York, USA. <https://doi.org/10.1145/3450741.3465242>
- Dolejšová, M., A. Botero, and J. H.-j. Choi. 2023. Open forest: walking-with feral stories, creatures, data. Proceedings of the 21st European Conference on Computer-Supported Cooperative Work. European Society for Socially Embedded Technologies, 5-9 June. Trondheim, Norway. https://doi.org/10.48340/ecscw2023_ep11
- Dolejšová, M., A. Botero, J. H.-j. Choi, M. Mitro, A. Pokrywka, T. Mattelmäki, and Chewie. 2024. Feral experiments in CreaTures

- Co-Laboratory. Special issue on Art of Research. Research in Arts and Education, in press.
- Durrer, V., A. Gilmore, and D. Stevenson. 2019. Arts councils, policy-making and “the local”. *Cultural Trends* 28:317-331. <https://doi.org/10.1080/09548963.2019.1644795>
- Escobar, A. 2020. *Pluriversal politics*. Duke University Press, Durham, North Carolina, USA.
- Fazey, I., J. R. A. Butler, J. Kozak, J. Dubinin, C. Manning-Broome, D. Reed, G. Leicester, S. A. Burge, and B. Searle. 2021. Three emergencies of climate change: the case of Louisiana’s coast. *Environmental Science & Policy* 124:45-54. <https://doi.org/10.1016/j.envsci.2021.05.014>
- Feola, G. 2015. Societal transformation in response to global environmental change: a review of emerging concepts. *Ambio* 44:376-390. <https://doi.org/10.1007/s13280-014-0582-z>
- Feola, G., O. Vincent, and D. Moore. 2021. (Un)making in sustainability transformation beyond capitalism. *Global Environmental Change* 69:102290. <https://doi.org/10.1016/j.gloenvcha.2021.102290>
- Fine, G. A. 1995. Wittgenstein’s kitchen: sharing meaning in restaurant work. *Theory and Society* 24:245-269. <https://doi.org/10.1007/BF00993398>
- Foreman-Wernet, L., and B. Dervin. 2017. Hidden depths and everyday secrets: how audience sense-making can inform arts policy and practice. *Journal of Arts Management, Law, and Society* 47:47-63. <https://doi.org/10.1080/10632921.2016.1229642>
- Furtherfield. 2022. *The Treaty of Finsbury park 2025*. <https://creatures-eu.org/productions/treaty/>
- Galafassi, D., S. Kagan, M. Milkoreit, M. Heras, C. Bilodeau, S. J. Bourke, A. Merrie, L. Guerrero, G. Pétursdóttir, and J. D. Tabara. 2018. ‘Raising the temperature’: the arts in a warming planet. *Current Opinion in Environmental Sustainability* 31:71-79. <https://doi.org/10.1016/j.cosust.2017.12.010>
- Gates, E. F., G. Page, M. N. Oporto, and J. Bohórquez. 2023. Ethics of evaluation for socio-ecological transformation: case-based critical systems analysis of motivation, power, expertise, and legitimacy. *Evaluation* 29:23-49. <https://doi.org/10.1177/13563890221129640>
- Gibson, G. 2022. Malign by design: imaginatively visualising Lovecraft and the aesthetics of monstrosity. Chapter 1 in M. S. Schotanus, editor. *Interdisciplinary essays on monsters and the monstrous*. Emerald, Leeds, UK. <https://doi.org/10.1108/978-1-80117-027-720221002>
- Golańska, D., and A. K. Kronenberg. 2020. Creative practice for sustainability: a new materialist perspective on activist production of eco-sensitive knowledges. *International Journal of Education Through Art* 16:303-318. https://doi.org/10.1386/eta_00035_1
- Hakio, K., and T. Mattelmäki. 2023. Turning inwards for change - the role of inner conditions in transformative co-design. *Design Journal* 26:838-855. <https://doi.org/10.1080/14606925.2023.2247272>
- Hawlina, H., O. C. Pedersen, and T. Zittoun. 2020. Imagination and social movements. *Current Opinion in Psychology* 35:31-35. <https://doi.org/10.1016/j.copsy.2020.02.009>
- Hebinck, A., J. M. Vervoort, P. Hebinck, L. Rutting, and F. Galli. 2018. Imagining transformative futures: participatory foresight for food systems change. *Ecology and Society* 23(2):16. <https://doi.org/10.5751/ES-10054-230216>
- Hellon. 2021. *Sustainable futures game*. CreaTures. <https://creatures-eu.org/productions/sfg/>
- Heras, M., D. Galafassi, E. Oteros-Rozas, F. Ravera, L. Berraquero-Díaz, and I. Ruiz-Mallén. 2021. Realising potentials for arts-based sustainability science. *Sustainability Science* 16:1875-1889. <https://doi.org/10.1007/s11625-021-01002-0>
- Heras, M., and J. D. Tabara. 2014. Let’s play transformations! Performative methods for sustainability. *Sustainability Science* 9:379-398. <https://doi.org/10.1007/s11625-014-0245-9>
- Houston, L., and A. Light. 2023. Mapping transformative creative practice. CreaTures. <https://creaturesframework.org/research/mapping-transformative-creative-practice.html>
- Houston, L., A. Light, and C. Thornton. 2022. The richness of designing for eco-social change: creative practice, transformative futures and living within limits. Eighth Workshop on Computing within Limits. LIMITS '22: Workshop on Computing within Limits, June 21-22. Association for Computing Machinery, New York, New York, USA. <https://computingwithinlimits.org/2022/papers/limits22-final-Houston.pdf>
- Jaakkola, N., M. Karvinen, K. Hakio, L.-A. Wolff, T. Mattelmäki, and M. Friman. 2022. Becoming self-aware—how do self-awareness and transformative learning fit in the sustainability competency discourse? *Frontiers in Education* 7. <https://doi.org/10.3389/educ.2022.855583>
- Jancovich, L., and D. Stevenson. 2021. Failure seems to be the hardest word to say. *International Journal of Cultural Policy* 27:967-981. <https://doi.org/10.1080/10286632.2021.1879798>
- Jasanoff, S., and S. H. Kim. 2015. *Dreamscapes of modernity: sociotechnical imaginaries and the fabrication of power*. University of Chicago Press, Chicago, Illinois, USA. <https://doi.org/10.7208/chicago/9780226276663.001.0001>
- Jasper, J. M. 2011. Emotions and social movements: twenty years of theory and research. *Annual Review of Sociology* 37:285-303. <https://doi.org/10.1146/annurev-soc-081309-150015>
- Kersnikova. 2022. *MyCoBiont*. CreaTures. <https://creatures-eu.org/productions/mycobiont/>
- Kristjanson, P., B. Harvey, M. Van Epp, and P. K. Thornton. 2014. Social learning and sustainable development. *Nature Climate Change* 4:5-7. <https://doi.org/10.1038/nclimate2080>
- Lakoff, G., and M. Johnson. 1980. *Metaphors we live by*. University of Chicago Press, Chicago, Illinois, USA. <https://doi.org/10.7208/chicago/9780226470993.001.0001>
- Lam, D. P. M., A. Jiménez-Aceituno, L. Guerrero Lara, M. M. Sellberg, A. V. Norström, M.-L. Moore, G. D. Peterson, and P. Olsson. 2022. Amplifying actions for food system transformation: insights from the Stockholm region. *Sustainability Science* 17:2379-2395. <https://doi.org/10.1007/s11625-022-01154-7>
- Law, J. 2003. *Making a mess with method*. Lancaster University, Department of Sociology and Centre for Science Studies, Lancaster, UK. <https://www.lancaster.ac.uk/fass/resources/sociology-online-papers/papers/law-making-a-mess-with-method.pdf>

- Lee, J.-J., M. Jaatinen, A. Salmi, T. Mattelmäki, R. Smeds, and M. Holopainen. 2018. Design choices framework for co-creation projects. *International Journal of Design* 12:15-31.
- Leventon, J., D. J. Abson, and D. J. Lang. 2021. Leverage points for sustainability transformations: nine guiding questions for sustainability science and practice. *Sustainability Science* 16:721-726. <https://doi.org/10.1007/s11625-021-00961-8>
- Light, A. 2022. Ecologies of subversion: troubling interaction design for climate care. *Interactions* 29:34-38. <https://doi.org/10.1145/3501301>
- Light, A. 2023. In dialogue with the more-than-human: affective prefiguration in encounters with others. *Interactions* 30:24-27. <https://doi.org/10.1145/3599956>
- Light, A., J. H.-j. Choi, L. Houston, and A. Botero. 2024. Enacting entanglement: CreaTurely socio-technical collaboration and designing a transformative ethos. *Proceedings of 22nd European Conference on Computer-Supported Cooperative Work, Rimini, Italy (ECSCW'24)*, in press.
- Light, A., R. Wolstenholme, and B. Twist. 2019. Creative practice and transformations to sustainability: insights for research. *Sussex Sustainability Research Programme Working Paper #1*. University of Sussex, UK.
- Lohmann, J., and Department of Seaweed 2021. *Baltic Sea Lab*. Department of Seaweed. CreaTures. <https://creatures-eu.org/productions/baltic-sea-lab/>
- Mattelmäki, T., S. Routarinne, and S. Ylirisku. 2011. Triggering the storytelling mode. In J. Buur, editor. *Participatory innovation conference*. University of Southern Denmark, Sønderborg, Denmark. <https://pin-c.sdu.dk/assets/triggering-the-storytelling-mode---tuuli-mattelm%C3%A4ki%2C-sara-routarinne%2C-salu-ylirisku---38-44---pinc-2011.pdf>
- Mayer, I., G. Bekebrede, C. Hartevelde, H. Warmelink, Q. Zhou, T. Van Ruijven, J. Lo, R. Kortmann, and I. Wenzler. 2014. The research and evaluation of serious games: toward a comprehensive methodology. *British Journal of Educational Technology* 45:502-527. <https://doi.org/10.1111/bjet.12067>
- McGovern, A. 2022. Risky, subversive, and deviant? A criminological analysis of guerrilla knitting. *Textile*. <https://doi.org/10.1080/14759756.2022.2085987>
- Meadows, D. 1999. *Leverage points: places to intervene in a system*. The Sustainability Institute, Hartland, Vermont, USA. https://donellameadows.org/wp-content/userfiles/Leverage_Points.pdf
- Meyrick, J., and T. Barnett. 2021. From public good to public value: arts and culture in a time of crisis. *Cultural Trends* 30:75-90. <https://doi.org/10.1080/09548963.2020.1844542>
- Milkoreit, M. 2017. Imaginary politics: climate change and making the future. *Elementa: Science of the Anthropocene* 5:62. <https://doi.org/10.1525/elementa.249>
- Milkoreit, M. 2019. Pop-cultural mobilization: deploying Game of Thrones to shift US climate change politics. *International Journal of Politics, Culture and Society* 32:61-82. <https://doi.org/10.1007/s10767-017-9273-7>
- Miller, M. 2022. View from the window. CreaTures. <https://creatures-eu.org/productions/view-from-the-window/>
- Mitlin, D. 2021. Editorial: citizen participation in planning: from the neighbourhood to the city. *Environment and Urbanization* 33:295-309. <https://doi.org/10.1177/09562478211035608>
- Moore, M.-L., and M. Milkoreit. 2020. Imagination and transformations to sustainable and just futures. *Elementa: Science of the Anthropocene* 8(1):081. <https://doi.org/10.1525/elementa.2020.081>
- Moriggi, A., K. Soini, B. B. Bock, and D. Roep. 2020b. Caring in, for, and with nature: an integrative framework to understand green care practices. *Sustainability* 12:3361. <https://doi.org/10.3390/su12083361>
- Moriggi, A., K. Soini, A. Franklin, and D. Roep. 2020a. A care-based approach to transformative change: ethically-informed practices, relational response-ability & emotional awareness. *Ethics, Policy & Environment* 23:281-298. <https://doi.org/10.1080/21550085.2020.1848186>
- Moser, S. C. 2016. Can science on transformation transform science? Lessons from co-design. *Current Opinion in Environmental Sustainability* 20:106-115. <https://doi.org/10.1016/j.cosust.2016.10.007>
- Moyer, J. M., and A. J. Sinclair. 2020. Learning for sustainability: considering pathways to transformation. *Adult Education Quarterly* 70:340-359. <https://doi.org/10.1177/0741713620912219>
- Nguyen, C. T. 2019. Monuments as commitments: how art speaks to groups and how groups think in art. *Pacific Philosophical Quarterly* 100:971-994. <https://doi.org/10.1111/papq.12279>
- Nicholas, G., J. Foote, K. Kainz, G. Midgley, K. Prager, and C. Zurbriggen. 2019. Towards a heart and soul for co-creative research practice: a systemic approach. *Evidence & Policy* 15:353-370. <https://doi.org/10.1332/174426419X15578220630571>
- Open Forest Collective. 2022. *Open forest: world making through environmental data*. CreaTures. <https://creatures-eu.org/productions/open-forest/>
- Patton, M. Q. 2019. Transformation to global sustainability: implications for evaluation and evaluators. *New Directions for Evaluation* 2019(162):103-117. <https://doi.org/10.1002/ev.20362>
- Rajan, R. S., and I. Chand O'Neal. 2018. *Arts evaluation and assessment. Measuring impact in schools and communities*. Palgrave MacMillan, Cham, Switzerland. <https://doi.org/10.1007/978-3-319-64116-4>
- Raudsepp-Hearne, C., G. D. Peterson, E. M. Bennett, R. Biggs, A. V. Norström, L. Pereira, J. Vervoort, D. M. Iwaniec, T. McPhearson, P. Olsson, T. Hichert, M. Falardeau, and A. J. Aceituno. 2020. Seeds of good anthropocenes: developing sustainability scenarios for Northern Europe. *Sustainability Science* 15:605-617. <https://doi.org/10.1007/s11625-019-00714-8>
- Reed, M. S., A. C. Evely, G. Cundill, I. Fazey, J. Glass, A. Laing, J. Newig, B. Parrish, C. Prell, C. Raymond, and L. C. Stringer. 2010. What is social learning? *Ecology and Society* 15(4):r1. <https://doi.org/10.5751/ES-03564-1504r01>

- Robinson, C. 2023. Imagination infrastructures at anticipation conference. Medium, 7 January. <https://cassierobinson.medium.com/imagination-infrastructures-at-anticipation-conference-ad0e1837d48b>
- Rodriguez-Labajos, B. 2022. Artistic activism promotes three major forms of sustainability transformation. *Current Opinion in Environmental Sustainability* 57:101199. <https://doi.org/10.1016/j.cosust.2022.101199>
- Rudd, G. 2022. Yarmouth springs eternal. CreaTures. <https://creatures-eu.org/productions/yarmouth-springs-eternal/>
- Rutting, L., J. Vervoort, H. Mees, L. Pereira, M. Veeger, K. Muiderman, A. Mangnus, K. Winkler, P. Olsson, T. Hichert, R. Lane, B. Bottega Pergher, L. Christiaens, N. Bansal, A. Hendriks, and P. Driessen. 2022. Disruptive seeds: a scenario approach to explore power shifts in sustainability transformations. *Sustainability Science* 18:1117-1133. <https://doi.org/10.1007/s11625-022-01251-7>
- Schedler, A. 2014. The criminal subversion of Mexican democracy. *Journal of Democracy* 25:5-18. <https://doi.org/10.1353/jod.2014.0016>
- Smrekar, M., G. Šutić, and Kersnikova. 2021. reProductive narratives. CreaTures. <https://creatures-eu.org/productions/rn/>
- Steffen, W., K. Richardson, J. Rockström, S. E. Cornell, I. Fetzer, E. M. Bennett, R. Biggs, S. R. Carpenter, W. De Vries, C. A. De Wit, C. Folke, D. Gerten, J. Heinke, G. M. Mace, L. M. Persson, V. Ramanathan, B. Reyers, and S. Sörlin. 2015. Planetary boundaries: guiding human development on a changing planet. *Science* 347(6223). <https://doi.org/10.1126/science.1259855>
- Stirling, A. 2008. "Opening up" and "closing down": power, participation, and pluralism in the social appraisal of technology. *Science, Technology & Human Values* 33:262-294. <https://doi.org/10.1177/0162243907311265>
- Summers-Effler, E. 2002. The micro potential for social change: emotion, consciousness, and social movement formation. *Sociological Theory* 20:41-60. <https://doi.org/10.1111/1467-9558.00150>
- Summers-Effler, E., and H. D. Kwak. 2015. Weber's missing mystics: inner-worldly mystical practices and the micro potential for social change. *Theory and Society* 44:251-282. <https://doi.org/10.1007/s11186-015-9250-y>
- Superflux. 2021a. Invocation for hope. Superflux, London, UK. <https://creatures-eu.org/productions/invocation/>
- Superflux. 2021b. Refuge for resurgence. Superflux, London, UK. <https://creatures-eu.org/productions/refuge/>
- Thanissaro Bhikkhu. 2012. *Tittha Sutta: Sectarians (1) Ud 6.4*. Translated from the Pali by Thanissaro Bhikkhu. Access to Insight (BCBS Edition). <https://www.accesstoinsight.org/tipitaka/kn/ud/ud.6.04.than.html>
- Thomas, J., and D. McDonagh. 2013. Shared language: towards more effective communication. *Australasian Medical Journal* 6:46-54. <https://doi.org/10.4066/AMJ.2013.1596>
- Thornton, C. 2020. The hologram: feminist, peer-to-peer health for a post-pandemic future. Pluto, London, UK.
- Thornton, C., L. Wallis, and Furtherfield. 2021. The hologram: collective health as a really beautiful artwork. CreaTures. <https://creatures-eu.org/productions/the-hologram/>
- Van Der Hoeven, A., R. Everts, M. Mulder, P. Berkers, E. Hitters, and P. Rutten. 2021. Valuing value in urban live music ecologies: negotiating the impact of live music in the Netherlands. *Journal of Cultural Economy* 15:216-231. <https://doi.org/10.1080/17530-350.2021.2002175>
- Van Oers, L., G. Feola, E. Moors, and H. Runhaar. 2021. The politics of deliberate destabilisation for sustainability transitions. *Environmental Innovation and Societal Transitions* 40:159-171. <https://doi.org/10.1016/j.eist.2021.06.003>
- Vervoort, J. 2022. Deep seriousness and deep playfulness are not opposites. Medium, 17 August. <https://anticipplay.medium.com/deep-seriousness-and-deep-playfulness-are-not-opposites-c57ee718105>
- Vervoort, J., I. Zamuruieva, M. Dolejšová, T. Smeenk, T. Mattelmäki, R. Wolstenholme, A. Light, C. Catlow, A. Jain, K. Vaajakallio, Z. Falay, C. Ampatzidou, J. H.-j. Choi, M. Van Veldhoven, L. Rutting, L. Reichelt, R. Lane, C. Moosdorff, J. Torrens, A. C. Mangnus, and all CreaTures. 2023b. Nine dimensions for evaluating creative practices: what they're for and how to use them. CreaTures. <https://creaturesframework.org/funding/creatures-dimensions.html>
- Vervoort, J., I. Zamuruieva, R. Wolstenholme, M. Dolejšová, L. Houston, T. Mattelmäki, T. Toikkanen, S. Ånäs, R. Lane, A. C. Mangnus, and all CreaTures. 2023a. Creative practices for better futures. CreaTures. <https://creaturesframework.org/creative-practices-for-better-futures.html>
- Vervoort, J. M., R. Bendor, A. Kelliher, O. Strik, and A. E. R. Helfgott. 2015. Scenarios and the art of worldmaking. *Futures* 74:62-70. <https://doi.org/10.1016/j.futures.2015.08.009>
- Vervoort, J. M., L. Rutting, K. Kok, F. L. P. Hermans, T. Veldkamp, A. K. Bregt, and R. Van Lammeren. 2012. Exploring dimensions, scales, and cross-scale dynamics from the perspectives of change agents in social-ecological systems. *Ecology and Society* 17(4):24. <https://doi.org/10.5751/ES-05098-170424>
- Vines, J., R. Clarke, P. Wright, J. McCarthy, and P. Olivier. 2013. Configuring participation: on how we involve people in design. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. Association for Computing Machinery, Paris, France. <https://doi.org/10.1145/2470654.2470716>
- Walton, M., E. F. Gates, and P. Vidueira. 2021. Insights and future directions for systems and complexity-informed evaluation. *New Directions for Evaluation* 2021:159-171. <https://doi.org/10.1002/ev.20459>
- Warren, K. 2000. *Ecofeminist philosophy: a western perspective on what it is and why it matters*. Rowman & Littlefield, Lanham, Maryland, USA.
- Weick, K. E., K. M. Sutcliffe, and D. Obstfeld. 2005. Organizing and the process of sensemaking. *Organization Science* 16:327-451. <https://doi.org/10.1287/orsc.1050.0133>
- Weiss, C. H. 1993. Where politics and evaluation research meet. *American Journal of Evaluation* 14:93-106. <https://doi.org/10.1177/109821409301400119>

Wells, B. L., and S. Gradwell. 2001. Gender and resource management: community supported agriculture as caring-practice. *Agriculture and Human Values* 18:107-119. <https://doi.org/10.1023/A:1007686617087>

West, S., L. J. Haider, S. Stålhammar, and S. Woroniecki. 2020. A relational turn for sustainability science? Relational thinking, leverage points and transformations. *Ecosystems and People* 16:304-325. <https://doi.org/10.1080/26395916.2020.1814417>

Zemos98. 2020. Gaming for the commons—Commonspoly. *CreaTures*. <https://creatures-eu.org/productions/commonspoly/>