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ARTFUL AND SENSORY SUSTAINABILITY SCIENCE: EXPLORING NOVEL METHODOLOGICAL PERSPECTIVES

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ABSTRACT: Sustainability science is marked by a quarter century of conceptual and methodological development. Despite successful expansion and promising experiences, there are limitations to be considered. This article argues that novel methodologies and methods need to be developed and employed to better grasp the qualitative complexity of human life, including its multisensorial and aesthetic dimensions. The methodological perspectives of sensory ethnography and arts-based research are discussed and a case study, in which pertinent methods have been employed, is presented. The article ends with an outlook on the potential of artful and sensory sustainability science.

KEYWORDS: sustainability science; sensory studies; arts-based research; methods; qualitative complexity.

RESUMO: A ciência da sustentabilidade é marcada por um quarto de século de desenvolvimento conceitual e metodológico. Apesar da expansão bem-sucedida e de experiências promissoras, existem limitações a serem consideradas. Este artigo argumenta que novas metodologias e métodos precisam ser desenvolvidos e empregados para melhor compreender a complexidade qualitativa da vida humana, incluindo suas dimensões multissensoriais e estéticas. As perspectivas metodológicas da etnografia sensorial e da pesquisa baseada em artes são discutidas e é apresentado um estudo de caso, no qual foram empregados os métodos pertinentes. O artigo conclui com uma perspectiva sobre o potencial da ciência da sustentabilidade artística e sensorial.

PALAVRAS-CHAVE: ciência da sustentabilidade; estudos sensoriais; pesquisa baseada em artes; métodos; complexidade qualitativa.

RESUMEN: La ciencia de la sostenibilidad está marcada por un cuarto de siglo de desarrollo conceptual y metodológico. A pesar de la expansión exitosa y las experiencias prometedoras, hay limitaciones a considerar. Este artículo argumenta que las nuevas metodologías y métodos deben desarrollarse y emplearse para comprender mejor la complejidad cualitativa

de la vida humana, incluidas sus dimensiones multisensoriales y estéticas. Se discuten las perspectivas metodológicas de la etnografía sensorial y la investigación basada en las artes y se presenta un estudio de caso, en el que se han empleado los métodos pertinentes. El artículo termina con una perspectiva sobre el potencial de la ciencia de la sostenibilidad ingeniosa y sensorial.

PALABRAS-CLAVE: ciencia de la sostenibilidad; estudios sensoriales; investigación basada en el arte; métodos; complejidad cualitativa.

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1. INTRODUCTION

Since its international advent the guiding vision of sustainable development has stimulated innumerable sustainability activities until the present day. And the adoption of the Transformation Agenda 2030 with the global sustainability goals in 2015, which provides a renewed framework for sustainable development till 2030, confirms the ongoing efforts (UN, 2015). The scientific community has, in part, picked up the challenge: Sustainability issues are dealt with in a broad range of disciplines from business administration (sustainability management) to chemistry (sustainable chemistry), and beyond disciplinary activities, the paradigm of sustainability science has emerged over the past two decades. The methodological perspective of transformative inter- and transdisciplinary sustainability science has been pushed forward in this context (Spangenberg, 2011; UN, 2015). Before this background the present article discusses to what extent sustainability science may expand its methodological scope even further towards novel methodological perspectives. Based on conceptual considerations and empirical insights regarding artful and sensory sustainability science we discuss in the following methodological aspects of arts-based methods and sensory ethnography and present a case study where arts-based and sensory methods have been applied. At the end of the article key features of practicing artful sustainability science are presented.

2. TRANSDISCIPLINARY SUSTAINABILITY SCIENCE-TRANSGRESSING LIMITATIONS

Sustainability science emerged as an academic field of research, teaching and practical engagement at the beginning of the 21st century (Kates et al., 2001). It is considered as a transdisciplinary academic activity, creating not only academic insights, but engaging

in co-producing practical knowledge together with societal actors; second, sustainability science has an explicit normative core due to its orientation to the value-laden guiding vision of sustainable development; third, beyond the analysis of problems, there is a strong solution-orientation in sustainability science. Despite these significant conceptual and methodological innovations, “mainstream” transdisciplinary sustainability science as practiced today has a methodological limit regarding its (re-)production of knowledge claims. In general, when it comes to established scientific procedures, norms and criteria, transdisciplinary transformational sustainability science appears little different than “normal science”. Wiek and Lang (Wiek & Lang, 2016, p.33) argue that, “for transformational sustainability research ... it is important to develop clear methodological guidelines (as it is important for any other field)”. Such guidelines provide researchers with instructions and quality criteria on how to conduct transformational sustainability research” and “the key condition is that the respective research activity adheres to quality criteria, including validity, reliability, saliency and so forth” and “transformational sustainability research develops evidence-supported solution options for sustainability problems. It shares with descriptive-analytical research the intention to provide credible knowledge, i.e., sufficient evidence for the effectiveness of the interventions”.

From this perspective, transdisciplinary transformational sustainability science is about the scientific construction of evidence-based, solution-oriented knowledge by including stakeholder knowledge, values and normative preferences in a procedure guided by (traditional) scientific criteria. It is a rational and cognitive-based procedure for transforming a situation.² The limit of transdisciplinary transformational sustainability science today can be seen in a hesitation to transgress more radical methodological boundaries into alternative ways of multisensorially, aesthetically and culturally experiencing the world and gaining insights, representations, imaginations and cognition beyond a limited realm of cognitive (re-)construction and abstraction. Looking at this bias towards a narrow cognitivism, it seems that transdisciplinary

¹ This article is based on previous publications of the authors on sensory sustainability science where conceptually and empirically sensory and arts-based approaches on sustainable development are explored: Heinrichs, H. (2018): Sustainability Science with Ozzy Osbourne, Julia Roberts and Ai Weiwei. The Potential of Arts-Based Research for Sustainable Development, *GALA*, 27/1, 132-137; Heinrichs, H. (2019): Strengthening Sensory Sustainability Science – Theoretical and Methodological Considerations, *Sustainability*, 11/3, 769; Kagan, S. (2017): Artful Sustainability: Queer-convivialist life-art and the artistic turn in sustainability research, *Transdisciplinary Journal of Engineering & Science*, 8, 151-168; Kagan, S. (2019): Artful Sustainability in Transdisciplinary Spaces of Possibilities, *Transdisciplinary Journal of Engineering & Science*, 10, 63-71.

² In this article, unless otherwise noted, we use the term “cognitive” in the narrower sense in which it is used in the social sciences, and not in its wider sense as used in cognitive sciences and psychology (except when we use expressions such as “embodied cognition”, which refer to the wider sense).



sustainability science has followed predominantly – but probably mostly implicitly – the so-called “linguistic turn” pointing to the role of (rational) discourse between actors from different societal spheres. More recent “turns” in social science and humanities, such as the “practice turn” (Cetina, Schatzki & von Savigny, 2005), “materiality turn” (Bennett & Joyce, 2010) and even more importantly the “sensory or affective turn” (Hoggett & Thompson 2012) are less prominent in sustainability science and have not been conceptually and methodologically systematized and employed. There is a rich body of theoretical insights from interdisciplinary sensory studies to (body-)phenomenology and embodied cognition, up to philosophy, cultural sociology and aesthetics, which show convincingly that humans are not only cognitive information processing machines but multisensorial beings constituted by complex, interrelated cognitive, emotional, affective, corporal conditions and sensorial-aesthetic experiences coined by particular socio-cultural conditions (Plessner 1980; Merleau-Ponty, 1965). Based on this insights conceptual explorations on artful and sensory sustainability science (Dieleman 2012, 2018; Maggs & Robinson 2016; Heinrichs 2019; Kagan 2011, 2017; Galafassi, 2018) and alternative methodologies for transdisciplinarity (Nicolescu 2002, 2014) point out the need of alternative methods that are better equipped than established quantitative, qualitative and transdisciplinary-participatory methods to grasp the underexposed dimensions of human reality. The next section discusses methodological considerations and displays methods, which aim at specifically addressing aspects such as sensorial experience, aesthetic perception and imagination.

3. METHODOLOGIES AND METHODS FOR ARTFUL AND SENSORY SUSTAINABILITY SCIENCE

New social and technological developments as well as theoretical innovation have inspired social sciences – and continue to do so – to develop its methodologies and methods. For example, computing technologies have fostered the impressive development of quantitative social research and the internet, social media and artificial intelligence are driving new methods for big data analysis. And the ascent of qualitative research is closely connected to the elaboration of the interpretative

paradigm. Closely connected – and partly within – the qualitative paradigm and based on theories of the senses and aesthetics, arts-based methods and sensory ethnography have emerged in the past three decades. In the following we discuss key features and the potential for sustainability science at first of sensory ethnography, followed by arts-based methods.

Ethnography developed as a qualitative-interpretative research approach in ethnology during colonial times (Breidenstein et al. 2015). Ethnologists undertook research expeditions, most often supported by vested interests of colonial states, to observe “exotic” cultures and gain a more detailed understanding of their practices, rituals and cosmologies. Beyond the methods of taking field notes based on observations, conducting (narrative) interviews or drawing humans and their physical environment, technological progress has been continuously adopted. Especially photography as well as audio and audio-visual recording techniques have been employed to comprehensively capture the unfamiliar life worlds (Pink 2013). Moreover, the method of participatory observation in order to gain deep understanding of the meaning behind visible practices became commonplace in ethnological ethnography. With the application of these methods over time, the objectivity of the (participatory) observer and its observation were questioned. The role of the researcher and its social impact within participatory observation were critically discussed, which finally led to a more (self-) reflexive ethnography.

The ethnographical way of doing research – explorative, observant, participatory, interpretative, qualitative – has spread beyond ethnology and the analysis of “exotic” cultures since the beginning of the 20th century. In anthropology and sociology, especially in urban sociology and sociology of everyday life, the ethnographic methodology has been employed to reconstruct societal practices and their particular (sub-)cultural meanings (Goffman 1973). Beyond the cognitive-represented and in surveys, expressed opinions, attitudes and value-orientations of people, the societal practices and the embodied implicit knowledge are of specific interest in these studies. Thus, ethnographic sociology provides an approach to grasp societal routines in their material environments



and illuminate macrosociological conditions within microsociological concretization.

A further development of ethnography has taken place over the past two decades related to the insights of sensory studies and the heightened attention on corporal-sensory dimensions of human action. The approach of sensory ethnography emphasizes the relevance of multisensoriality for human life (Pink 2015). In this methodological perspective, the different senses—smell, taste, visual, audio, touch, kinesthetic—their interconnection with each other and their relation with key aspects of human existence such as perception, place, knowing, memory and imagination are put at the center of ethnographic inquiry. By shifting the ethnographic focus more explicitly to the sensory experiences, ethnographic research is challenged to renew its ways of observation and interpretation of ‘outlandish’ social practices. Beyond cognitive reconstruction and interpretation of social action, it is about lifting the often unnoticed, invisible sensory and affective aspects in socio-material practices. The addressing of corporal-sensory life experience stimulated a new level of ethnographic (self-)reflection and innovation of methods (Elliott & Culhane 2017). The spectrum ranges from greater sensitivity towards autoethnography, gendered ethnography, interventionist ethnography, up to creative use of digital media technologies such as eye-tracking or smartphones in participatory audio-visual recording. Regarding the irreducible corporality of human existence, audio-visual ethnographic methods are considered to play an especially important role in order to capture corporal behavior in its physical environment.

The production, representation and communication of sensory ethnographic insights transgresses proactively and in significant ways the traditional forms of positivist, number- and text-based, scientifically-styled knowledge creation through distant researchers. Through creative methodologies and imaginative practices, from walking as an ethnographic strategy, to (fictional or poetic) writing, up to performances and (experimental) recording and editing, interpretative horizons are opened up and the potentiality of societal practices is explored in collaborative processes between researchers and research subjects. This way of performing sensory ethnography overlaps with the second methodological perspective considered here, specifically promising to contribute to a more

full understanding of multisensorial human realities: arts-based research.

Arts-based research (ABR) is a relatively new methodological paradigm in social and cultural sciences. It has its roots in early attempts of individual researchers at the fringes of their disciplines to avoid scientific reductionism by using methods of the creative arts to gain more holistic insights into human experiences and practices. Alongside individual outsider scientists who refused to play by the (academic) rules of the game and were brave enough to cross methodological boundaries, a second driver for arts-based research came from developments in arts therapy from the 1970s onwards (MacNiff 1998). Findings in psychology and research on social work show that the creative arts—whether it be visual arts, theatre, dance or fictional writing—have significant potential for initiating critical (self-)reflection, thus opening up new perspectives in psychological and social therapies. In the 1990s, arts-based research finally developed into its own branch of qualitative social science research (Barone & Eisner 2011). Since then, there has been an ongoing process of differentiation and professionalization, providing a theoretical foundation and a set of arts-based research methods that allow its use in a wide range of social science disciplines. Thus, arts-based research is now considered a creative research practice providing an alternative way of knowledge production and communication alongside traditional quantitative and qualitative scientific methodologies.

Arts-based research provides an alternative methodology in which scientific and artistic ways of sense-making converge. It is about aesthetic knowing and aesthetic practice. Aesthetic is used in this context in its basic meaning of sensory perception and intuition. Scientific inquiry can be enriched by artistic ways of knowing, because they complement scientific procedures which are generally abstract, reductive, cognitive and verbalized (Leavy 2015, p. 20). Arts-based research:

- recognizes that art has always been able to convey truth(s);
- recognizes that the use of the arts is critical in achieving self/other knowledge;
- values preverbal ways of knowing;
- includes multiple ways of knowing, such as sensory, kinesthetic and imaginative





Arts-based research mobilizes embodied cognition. The importance of the body in movement (kinaesthetics), of the senses (as also stressed in phenomenology), of emotions, of intuitions, of the subconscious and of tacit knowing, are all recognized and can all be mobilized in arts-based research through embodied questions. The arts explore the space between what is known and what is not. They explore into darkness, while allowing ambiguities and ambivalences. They also enhance the critical awareness of the subjective self of the researcher as an author and as a story-teller. The researcher can then take responsibility for one's imagination and reflect on it, not just mindfully but also intuitively and corporeally. Arts-based research develops imaginative investigations that articulate constellations of possible meanings, allowing a large freedom of 'lateral', associative thinking, working with lived experience.

Arts-based researchers develop a heightened awareness of the multiple levels and processes of interpretation at play in perception and in further cognitive and inter-subjective communicative processes. They find and develop ways to express the kinds of knowledge that cannot be expressed merely by denotative writings, put more focus than traditional researchers on contextual knowledge, and include the audience/recipients of the interpretative work in the knowledge production process, contributing to a deeper, richer form of participative knowledge-production.

Thus, arts-based methods allow for a more holistic understanding as they open up an alternative way of understanding and interpreting reality, reveal multiple meanings of phenomena and strengthen empathetic awareness-raising.

Patricia Leavy differentiates eight fields of arts-based research: narrative inquiry, fiction-based research, poetry, music, dance, theatre, film and visual art.

Regarding fiction-based research, Leavy (2015, p. 55/56) argues: "Fiction as a research practice, based on narrative inquiry, is well suited for portraying the complexity of lived experience because it allows for details, nuance, specificity, contexts, and texture; cultivating empathy and self-reflection through relatable characters; and disrupting dominant ideologies or stereotypes by showing and not telling". The potential of fiction to create condensed descriptions by means of

composite characters and internal monologues to portray the messiness and contradictions of real-world experiences may provide new insights through a more empathetic understanding. At the same time, it fosters outreach beyond specialized scientific communities because novels serve as entertainment as well as (self-)reflection. The key difference to the work of a professional novelist is that the starting point in ABR is a scientific topic and question and that scientific literature, concepts and empirical studies are consulted to create the work of fiction. Through a process of narrative inquiry and observation of interactions, a work of fiction is constructed, its format shaping the production of knowledge while creating distinct insights and communicative power.

Other arts-based methods go beyond textual approaches involving narratives, fiction or poetry to address other sensorial modes. Music, for example, makes use of sound, melody and rhythm, and is often combined with language, to bridge cognitive and emotional dimensions. This method has proven to be especially fruitful in projects with marginalized groups to gain insight into and increase self-awareness of situated circumstances as well as to express experiences, intuitions, emotions and perceptions in a multisensorial way. Music history is full of examples of cultural criticism that impact people on both an intellectual and an emotional level.

Theatre and film address even more senses because language, movement, visual impression, sound and tactile experience—imagined or real, such as in participatory theatre—are merged, thus bringing it closest to everyday multisensorial experience. In addition, through dramaturgy and plot—in analogy to narrative inquiry and fiction-based research—insights can be created and communicated in an aesthetic manner. It is important to note that theatre and film, as the other arts-based methods, are understood in this context not only as tools for representation and the communication of social scientific insights, but as a research approach in their own right. The process of creating a play based on a scientific topic or question using the investigation and interpretation of data and information from various sources is itself a form of research. It has the aim of discovering new insights and presenting them to the public in a different way than the usual academic research-and-publish



format. Similar to literature or music, the history of theatre and film is full of examples of critical reflections on social, economic or ecological real world challenges.

The broad field of the visual arts—ranging from painting through installations, artistic film and digital media, to performances—provides a rich array of resources for arts-based research as well. The line between theatre and film and another arts-based method, visual art, is sometimes blurred; yet depending on the type of social scientific research being carried out and the specific question at hand, the radical freedom of visual arts allows for the greatest creativity in the production and communication of insights in diverse sensorial ways.

In contrast to many of these arts-based methods, dance and movement are explicitly non-verbal. This does not hinder dance, especially (post)modern dance, from providing opportunities to critically investigate and represent embodied knowledge, embodied habitus and cultural norms. Given that routines as embodied habitus and social practices are a key challenge to unsustainability, they could be explored and represented through bodily performances and transformations of bodily behavior in space and time. As with other arts-based methods, however, dance and movement are certainly not capable of contributing insights and delivering an aesthetic form of representation to every kind of research question.

As in every good research practice, an arts-based method should be carefully selected with regard to the object of investigation. Along with quantitative and qualitative methods in the social sciences, arts-based methods provide new possibilities for both producing and communicating knowledge. If a decision is made in favor of arts-based methods in a specific research project, then, in a second step, the most appropriate arts-based method must be carefully selected. However, the selection of a method is not usually determined by the objective and the research question. In research practice, it is the resources: time, skills and funding, that influence the selection of a method. This is especially true for the use of arts-based methods. Without doubt a professional novelist, filmmaker, playwright, choreographer or visual artist with their training and talent will be better equipped to produce novels, films, plays, dance performance or paintings with

higher aesthetic quality than a scientist. On the other hand, researchers with their training and expertise are better prepared to formulate research questions in their respective fields. There are basically two ways of dealing with the issue of competence and skills in arts-based research. Either the researcher collaborates with an interested artist and their areas of expertise complement each other or the researcher develops skills and competences in a specific arts-based method, for example by learning creative writing techniques, and produces a scientific work of fiction. Both options certainly have advantages and disadvantages. Ultimately, what is most important is the recognition that arts-based research is a hybrid of the arts and science. Scientific research should be oriented towards artistic qualities and aesthetics because the goal is to produce and communicate knowledge in a multisensorial way.

By creatively employing artistic methods in social scientific inquiry, an alternative form of production of knowledge and communication has been developed over the past two decades. Arts-based research now provides, despite some overlaps with the logic of qualitative-interpretative research, a distinct methodological approach alongside traditional quantitative and qualitative methodologies as pointed out by Leavy (2015, Table 1).

The theoretical and methodological considerations discussed so far have aimed at mapping out interesting developments in social sciences over the past decades, which may help to pave the way towards a more sensory and artful sustainability science. On the one hand the theoretical insights about the role of corporal, sensorial, affective, atmospheric dimensions in societal practices as well as the relevance of cognitive-corporal resonance for human relations to its worlds are of fundamental relevance. On the other hand the methodological perspectives of sensory ethnography and arts-based methods to empirically access the theoretically captured multisensorial reality of human life reveals the potential of this epistemological perspective for sustainability science. Sustainability science deals specifically with (un)sustainable social practices regarding the build and natural environment, with (un)sustainable and (un)just interactions between humans and non-human entities, and aims at providing solution-oriented, transformative knowledge.



**Table 1. The following table gives an overview of the specificities of arts-based methods compared to quantitative and qualitative methods (Leavy 2015, 294)**

QUANTITATIVE	QUALITATIVE	ARTS-BASED
numbers	words	stories, images, sounds, scenes, other sensory inputs
data discovery	data collection	data or content generation
measurement	meaning	evocation
tabulating	writing	(re)presentation
value neutrality	value non-neutrality	political/emancipatory consciousness
reliability	process	authenticity
validity	interpretation	truthfulness
proof	persuasion	compelling/ moving/ aesthetic power
generalisability	transferability	resonance
disciplinarity	interdisciplinarity	transdisciplinarity

However, these challenges are overwhelmingly approached in sustainability science through normative, discursive, textualist, mentalist ways, and through an excessive narrowing-down of possibilities in the solutions-orientation. Taking seriously the theoretical and methodological considerations presented here, the at least partly unconscious, multisensorial experiences in (un)sustainable practices should be moved from the margins somewhat more to the center. Looking at sustainability issues through the lens of sensory sustainability science, grounded in the outlined theoretical and methodological approaches, a wide range of research topics arise, for example: corporal-sensorial manifestations in varying mobility options; atmospheres in nature-, land- and city-scapes; resonance in human/non-human interactions; multisensorial dimensions in varying occupational and consumption practices; sensory scapes of places: smell, taste, touch, sight, hearing and kinesthetic; relationship between virtual (mediate) and real (immediate) multisensorial phenomena; socio-cultural diversity of corporal-sensorial experience, cognitive evaluation and imagination. These prime examples may indicate the potential of a sensory and artful sustainability science to open up a new, complementary perspective for scientific engagement on sustainable development.

4. TRANSDISCIPLINARY HERMENEUTICS FOR ARTFUL SUSTAINABILITY SCIENCE

Arts-based methods contribute to a “transdisciplinary hermeneutics” (Dieleman, 2018) for artful sustainability science whereby a dynamic and complex relation between different ways of knowing and different ways of making worlds may be developed. One of the ways this happens is through aesthetics of qualitative complexity (Kagan, 2011), which are helpful in departing from reductionism. Aesthetics of complexity is a percipience to the patterns drawn by qualitatively complex relations. Qualitatively complex relations, after (Morin, 2008) are relations whereby various elements relate to each other in ways that are at once (1) complementary, (2) competing, (3) antagonistic and (4) belonging to a unitary process, without any single of these four relationships overseeing the others. Dealing with qualitatively complex relations requires a sensitivity to such relations and a capacity to work with ambiguity, ambivalence and uncertainty, not attempting to solve all perceived contradictions – i.e. not trying to eliminate or always solve paradoxes, but thinking through them. Logico-deductive thinking, though necessary to solve less complex problems, is largely insufficient and unable to grasp qualitative complexity.



The required complex thinking, put in service of sustainability, involves four aspects: (1) recognizing and working with emergence (rather than merely relying on planning and control); (2) integrating uncertainty and non-knowing into the transdisciplinary hermeneutics (Dieleman, 2018); (3) sharing partial views and acknowledging not only the value but also the limits of any expertise and any rational analysis (Haraway, 1988); and (4) mobilizing the generative intelligence of desires and of imagination (Maggs & Robinson, 2016) for anticipation beyond the limitations of incremental thinking. Complex thinking for sustainability calls forward “question-based learning” (Haley, 2011) focused on enabling and “ennobling” questions that highlight qualitatively complex relations and indeterminacy, rather than a problem-based learning focused on solutions that precipitate closure through finite answers.

Arts-based methods allow such a question-based learning. The goal of research is then not to provide definite answers to defined questions, but to make research questions more interesting by deepening them, and thereby open up more possibilities in societal deliberations. Arts-based methods develop arousing, evocative and reflexively stimulating questions & symbols. The arts are amongst the ways to decipher the world that help us reach the depths of complexity of symbolic thinking (Nicolescu, 2014). Question-based learning then opens up multiple perspectives and multiple attentions at once, helping societal “spaces of possibilities” for sustainable futures to emerge.

In order to put “flesh to the bones” we present in the following section an illustrative case, in which selected arts-based methods and sensory ethnography have been applied.

5. ILLUSTRATIVE CASE: EXPLORING SPACES OF POSSIBILITY IN THE CITY OF HANNOVER

The research project “City as Space of Possibility” (Leuphana University Lüneburg, 2015–2018, empirically focused on the city of Hanover, Germany), an inter-faculty consortium led by Volker Kirchberg, Ursula Weisenfeld, Ute Stoltenberg and Sacha Kagan at the Leuphana University Lüneburg3,

investigated the qualities characterizing “urban spaces of possibility for sustainable urban development” (Kagan, Kirchberg & Weisenfeld 2019), that is (geographic, social and mental) spaces in the city where the combination of imagination and experimentation open up future-oriented questions and perspectives (Dieleman, 2012; Kagan et al., 2018). Beyond awareness-raising projects or protest movements, the research focused on the active “production of space” and the formation of “real utopias” (Wright, 2010). The project employed, in complement to more established qualitative and quantitative social-scientific research methods as well as several typical transdisciplinary-participatory workshops with societal actors, also several sensory-ethnographic and arts-based methods.

To better understand the urban fabric of the city, Kagan led a series of city walks across Hanover by researchers and students. The walking-based methods included: (1) so-called “Transect Walks” (Kohler, 2014), with which one traverses large distances across the urban area in order to empirically grasp the phenomenology of urban space systematically across a cross-section of a city’s urban districts; (2) “Walking with Video” (WwV) (Pink, 2007), a sensory ethnographic method that allows to participate in the perception of urban places through some of their inhabitants; and (3) soundwalks (Adams et al., 2008) and walking-art experiments that gave us further site-specific insights. These walks were documented with videorecorders, photo cameras, audio recorders and written notes. This allowed us to consciously perceive and interpret urban spaces, among researchers from various disciplinary backgrounds and together with residents.

Transect walks are walks taken through an entire city, with a set starting-point somewhere where the urban fabric ‘begins’, and a roughly-set end-point where the urban fabric ‘ends’. A transect walk can thus take from a few hours in a small town to several days in a vast city. Such walks are serendipitous, using a drawn line on a map only as a loose guideline, leaving the map out of view most of the time, letting curiosity lead one on sideways, and especially paying attention to often break the own (established or emergent) patterns of attention and of walking (e.g. to stop taking back-alleys and instead walk up a main avenue). Such walks bring a corrective to the ‘view from above’ of maps

³ This research project was funded by the “Niedersächsisches Vorab” of the Lower-Saxonian Ministry of Research as part of their new “Science for Sustainable Development” program.



and high vantage points. They allow attention to ground details and passage through them. As they force one to traverse a whole city at slow pace (and not only visit selected sites), imposing a certain slow systematic observational procedure, transect walks do an excellent job both at laying out the city's diverse urban fabric and at discerning in which relative proportions to each other the different urban forms and types of neighborhoods exist in a city. Through their whole-day duration, transect walks set the walkers into a heterochrony (Foucault, 1984) a different experience of time, temporarily releasing the walker from the dominant experience of time regulated by the rhythms of a hegemonic order, and thus allowing another reading of the city.

The researchers' transect walks through Hanover connected several strings of research interests: qualities of urban spaces, between "third places" (Oldenburg, 1989), private space, public space and commons; observed and/or experienced "border" and/or "boundaries" (Sennett, 2012) between urban areas; relations between soundscapes, the urban fabric and the configurations of nature-culture relations in the city; the social, cultural and economic characteristics of different neighborhoods; urban traffic and (un)sustainable urban mobility; and the different symbols and atmospheres of different districts.

The WwV walks to sites of local sustainability-relevant projects and WwV-walks through entire neighborhoods with local guides, helped the researchers find out more about how a project-site or a network of places in a neighborhood "creates an alternative sensory context to those framed" (Pink, 2008) during the rest of the year by dominant consumer culture, businesses, and the associated dominant practices & sensory pleasures and displeasures that they usually convey. Many questions abound then, such as: How are experiences made available and appropriate-able to local residents through the site we are visiting? How are these experiences special, or particular, ordinary and/or extra-ordinary? Does one feel invited and/or confronted? Does one witness or can retrace some forms of transmission of "sensory skilled knowledge and practice" (Pink, 2008) at the project site? Does one witness or can retrace ways in which different participants at the site educate each other's attention?

The WwV-walks in Hanover allowed the researchers to learn in embodied and context-sensitive ways from multiple perspectives on single sites, including: vegan-activists perspectives and food-artists perspectives on the city's urban gardens, food economy, cultural activities and street life; young Parkour 'traceurs' perspectives on the city's infrastructures, urban forms, (un-) sustainable mobility policy and youth policy; visual artists perspectives on the visual signs and visual language in the city's streets, buildings and urban gardens, and pointing to possibilities of artful DIY-responsibilization for sustainable urban development; performing artists perspectives on various subtle details of social life and socio-political issues in the city; local artists, researchers and activists perspectives on historical-political, economic and socio-cultural developments in specific neighborhoods; urban activists and architects perspectives on challenges, failures and possibilities of urban development in specific sites and buildings; local crafts-&-businesspeople perspectives on opportunities for ecologically and socially responsible business; and everyday-life creative-activists perspectives on potential Spaces of Possibility for sustainability-oriented activism (e.g. guerilla gardening, upcycling, local currencies, etc.) in different areas and specific sites in the city. In all these instances, the WwV sensory-ethnographic approach allowed the researchers to contextualize and spatialize the professional and/or activist perspectives within a local guides' inter-subjective place-making situatedness. Selected extracts from the video material of the WwV-walks were also used in Kagan's 88 minutes documentary film *Hanover: urban spaces of possibilities for sustainable futures*, which constituted a hybrid science-based and arts-based research output next to traditional scientific publications.

The research also mobilized performative urban-intervention as arts-based method. For example, in Summer 2017, Kagan co-organised a workshop and an urban art intervention in public space with "Tante Trottoir", with the participation of university students together with inhabitants of Hanover (connected to Kagan's MA seminar "the practice of artistic urban intervention"). "The Wondrous Action Alliance of Tante Trottoir" is an artistic initiative founded in 2015 by the performers Lisa Grosche, Astrid Köhler and Lena Kussmann,



and hosted at the independent Theater at Glocksee in Hanover. Tante Trottoir stages participative performance-based artistic interventions in public spaces. It aims to develop a subtle and suggestive approach with the aim to shift perceptions of passers-by in the direction of civic empathy, care and solidarity. The theme that emerged from the common workshop was: rebuilding mutual trust in public space in times of terrorist threats and paranoid security “measures”. The chosen symbols sought a fine balance between ambivalent irritation and subtlety: give-away muffins that “could be poisonous, could be delicious”; a selfie photo-op with a person who “could be a terrorist, could be the love of your life”; a short performance in a public square, on a towel, of some blurred mixture of yoga and Muslim prayer performed alternatively and/or together by a blond white male and two male refugees from Syria and Afghanistan; and a suitcase left unattended, yet set-up as a wondrous mystery picture box inviting the passers-by to satisfy their curiosity by looking into its holes (that last element was not implemented, as the police forbade it).

The spaces of possibility opened up by Tante Trottoir are generally characterized on the one hand by a rather abstracted, generalized and personal, subjective exploration of themes that concern participants, through workshops aiming for a mix of mindfulness and playful lightness (and avoiding direct and concrete issues where specific protagonists and antagonists would be identified) and, on the other, by a concrete focus on a specific site in both its multisensory (phenomenological) and social (and intercultural) qualities and potentials, through urban interventions. The stimulation of participant imaginations (in the workshops and at interventions) does not directly aim at creating visions and ideas for potential futures, but rather orients them to immediate realities (both felt directly by the participants and related to current news carried in the media) and suggests new perspectives and interpretations that show potential positive/sustainable responses to current issues. Workshop participants are invited to fantasize and brainstorm beyond realistic and conventional ideas. The images materialized and/or performed at an intervention are merely one fraction of the many ideas generated by the participants in the final phases of the workshop, which

is carried out a couple of weeks before an intervention. Then, the urban interventions initiate processes to change the imaginations of passers-by of a concrete space and situation in a creative process (the passers-by are free to choose to what extent they wish to interact with the intervention). The interventions of Tante Trottoir involve specific imaginary elements with unexpected and irritating yet poetic, oneiric and bucolic-stylish qualities, generating different, unexpected, new images. These images, in their diversity (as each art intervention approaches a different theme and takes a different form) often suggest that more mutual help and care for strangers in public spaces are possible and desirable. Tante Trottoir often invokes an alternative experience of time that is more mindful, slower, more relaxed and peaceful, and allowing caring relationships (addressing stress, hectic and insensitivity to others with whom we share the public space in urban settings).

Further arts-based methods were involved in the project, including a filmed performative re-enactment of a decades-old political speech on the former World Expo site (contrasting the now rather desolate and lifeless site with its utopian beginnings), design thinking in connection to further embodied exercises, and urban photography. Besides, students of Ursula Weisenfeld and Antoniya Hauerwaas conceptualized a participatory photographic arts-based research format for homeless people of Hannover that was then taken up by local NGOs and the municipality, practiced by a group of homeless people, and exhibited in city hall, revealing perspectives of homeless photographers on the city and some of its urban, economic and social issues.

Most project insights are gathered in a German publication (Kagan, Kirchberg & Weisenfeld, 2019). One of the many research insights, to which arts-based methods contributed substantially, concerned how spaces for imagination exist in a mutually constitutive relation with social practices and spaces of experimentation, and how sustainability-related urban imaginaries are emplaced at multiple levels such as: in the embodied and mental space of the self, in the self in relation to changing sites in public space, in ambivalent and contrasted relations to specific architectural ensembles, in fictionalised and blurred common/private-homelike spaces occupying public space,



and in festivalized social spaces of convivial learning. The research indicated that imagination is fundamental to place-making and engagement with urban development. Rich, diverse and preferably complex imaginaries of sustainability are essential to the development of sustainability-related social practices and institutional changes, through the mobilization of such imaginaries and of the imagination in urban spaces of possibility (Kagan, 2018).

6. OUTLOOK

In the face of persisting unsustainable developments around the world, sustainability actors are challenged to reflect their activities and explore additional and new ways to drive sustainable development. Not least, this is true for sustainability science as well. Sustainability science has developed over the past 20 years into an innovative and vibrant academic field. It has repeatedly adopted new methodological approaches, such as the move towards transdisciplinary transformative sustainability science, and continues to experiment with new ways in research and development. There is now a striking diversity of methods being employed in this field. However, sustainability science is about the scientific construction of evidence-based, solution-oriented knowledge by including stakeholder knowledge, values and normative preferences in a procedure guided by (traditional) scientific criteria. Thus, it is basically about gathering valid and reliable data generated by quantitative and qualitative methods in a participatory process; making a text-based scientific argumentation reflecting abstract, rational and cognitive procedures for transforming a situation or recommending a solution; and then communicating knowledge mainly through traditional academic publishing practices. In this sense, the limit of sustainability science today can be understood as a hesitation to transgress more radically theoretical and methodological boundaries into alternative ways of accessing the world and gaining insights and representations beyond cognitive (re-)construction and abstraction, reaching another epistemological quality of transdisciplinarity as advocated by Basarab Nicolescu (2014, 2002). Surely, there are already several creative projects and studies working with practice theory, ethnographic or arts-based methods

in sustainability research across the world as has been mentioned at the beginning of this article. However, there is lots of room for a wider and more systematic application.

The methodological considerations discussed in this article may help to enable a more systematic artful and sensory sustainability science. It opens up the epistemological perspective from a mentalist, textualist, discursive, rationalized idea of humans towards grasping with novel methods the corporal-sensorial affective dimensions of human action in routinized socio-material practices, and allow for new imaginative processes as the illustrative case has suggested. Thus, it would allow for a more balanced, encompassing understanding and reflection of (un)sustainable societal developments and provide new ways for transformative efforts.

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