

## RESEARCH ARTICLE

# Restoring our senses, restoring the Earth. Fostering imaginative capacities through the arts for envisioning climate transformations

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Humanity has never lived in a world of global average temperature above two degrees of current levels. Moving towards such High-End Climate Change (HECC) futures presents fundamental challenges to current governance structures and involves the need to confront high uncertainties, non-linear dynamics and multiple irreversibilities in global social-ecological systems. In order to face HECC, imaginative practices able to support multiple ways of learning about and experiencing the future are necessary. In this article we analysed a set of arts-based activities conducted within the five-year EU-funded project IMPRESSIONS aimed at identifying transformative strategies to high-end climate change. The exploratory artistic activities were carried out alongside a science-led participatory integrated assessment process with stakeholders from the Iberian Peninsula. Our arts-based approach combined a range of performative, visual and reflexive practices with the ambition to reach out to more-than-rational but also practical elements of HECC futures. Our study suggests that the arts-based approach helped to bring out new ways of seeing, feeling and interpreting the world which may support the development of individual and collective sensibilities needed to address HECC.

**Keywords:** Arts-based research; Art-science interfacing; High-end climate change; Knowledge coproduction; Action-research; Transdisciplinarity; Imaginative practices; Transformative strategies design

## Introduction

Climate change is a global challenge with the potential to transform ways of thinking about ourselves, our relations with the biosphere and our responsibilities towards future generations (Hulme 2009; Pelling et al. 2014; O'Brien and Selboe 2015). However, it is increasingly recognized that the ability of current societies to respond to the interconnected global challenges of our time is unlikely to suffice if only focused on the biophysical and technical aspects of climate change (O'Brien 2009). Many authors have called for a move beyond the technological fixes or simple managerial solutions: and in particular towards a view of climate as a social and human challenge that requires transformative changes throughout institutions, practices, worldviews and visions of how societies are to shape planet Earth in the Anthropocene (O'Brien 2009, Hulme 2009, Pelling et al. 2014, O'Brien and Selboe 2015, Wapner and Elver 2016, O'Brien 2018).

Despite some claimed successes in international climate negotiations, it has been argued that currently societies worldwide are not on a trajectory to stay below 2°C–1.5°C average global temperature increase as stated in the Paris

Agreement of 2015 (Anderson and Peters 2016; Peters et al. 2017). A High-End Climate Change (HECC), that is, beyond 2°C warming in global average temperatures is an increasing likely possibility. The implications and risks of HECC are only beginning to be assessed but arguably HECC will pose unprecedented challenges and opportunities for social-ecological transformation (Berry et al. 2017).

Transformations have been conceptualized in a variety of ways across disciplines (Feola 2015). Running across them is the notion that transformations entail fundamental changes in values, beliefs, worldviews, as well as in societal practices, networks configurations and relationships between society and biophysical systems (Westley et al. 2011, Loorbach 2014). Visions have for long been described as central to the mobilization and design of transformative strategies – i.e. the coordinated cross-scale activities aimed at generating novel social-ecological interactions (Meadows 1999, Westley et al. 1989, Kahane 2012, Wiek and Iwaniec 2013, Westley et al. 2013, Goldstein et al. 2013, Tàbara, Jäger, Harrison et al. 2018). Visions help to explore, redefine, connect and unveil novel aspects of existing social-ecological realities so as to create new sources for hope and avenues for action (Huitema and Meijerink 2010, Westley et al. 2011). For instance, Olsson et al. (2008) demonstrated that a catalytic phase in the transformation of the water governance in Kristianstad in southern Sweden happened when a group of actors began to imagine the local water

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system as “water-rich” instead of the former image of “water-sick”. In Spain, the “New Water Culture Movement”, which successfully managed to stop the environmentally harmful National Hydrologic Plan a decade ago, was also triggered by articulating an alternative and engaging vision of water resource management in Spanish policy (Tàbara and Ilhan 2008). It is in this sense that transformative strategies are more likely to emerge from alternative and positive images of the world rather than disempowering fear or other fatalists accounts of a dooming future (Nuttall 2012; O’Neill and Nicholson-Cole 2009).

There is mounting interest, among sustainability science scholars, in the process of designing transformative strategies through visioning (Wiek and Iwaniec 2013). Critical to visioning processes is the inquiry into deep-seated beliefs and assumptions (Kahane 2012). Such processes involve an inquiry into more-than-rational aspects of human experience, expression and identity. These elements include emotions, imagination, ethics, aesthetic preferences and images, as well as commitments to cultural values and conventions. However, a large portion of conventional approaches in sustainability science like scenario planning or multi-criteria analysis tend to give more emphasis on the instrumental and rational aspects of systems dynamics exploration. At the intersection between arts and sciences, a recent wave of scholarship is exploring an extension of this palette of techniques drawing from arts-based approaches (Heras and Tàbara 2014, Kagan 2015, Scheffer et al. 2015, Heras et al. 2016, Milkoreit 2016, Merrie et al. 2017). A key driving force of this development is the perceived need to bolster the intrinsic emotional, intuitive and more-than-rational elements of ‘sensing’ and visioning future possibilities. Engagement through arts-based approaches may support the integration and mobilization of multiple kinds of knowledge, imagination, and intelligences (including emotional, social or experiential) (Sullivan 2010, Tengö et al. 2014, Leavy 2015, Moore et al. 2015, Rathwell and Armitage 2016, Page et al. 2016, Brown et al. 2017, Hulme 2017).

In this paper, we embark further along this research frontier with a description and analysis of a series of artistic activities aimed at complementing, and whenever possible challenging, the imaginative exploration of transformative strategies to address high-end climate change in the context of the EU-funded project IMPRESSIONS.<sup>1</sup> We developed and conducted arts-based activities, including performances, visual methods and exhibition, alongside a science-led integrated assessment with stakeholders of the Iberian Peninsula. The purpose of this paper is to identify and assess some of the critical ways in which arts-based approaches can contribute within participatory integrated assessment of transformative strategies to address the climate change challenge.

### High-end climate change, imagination and the arts

A nascent stream of literature has claimed that imagination is central to responses to climate change (Wapner and Elver 2016, Milkoreit 2016). The first key reason is that complex and highly interconnected systems have multi-

ple cross-scale causes and effects, hence imagination is an integral part of the required capacities for perceiving relations between various elements. Another aspect is that imaginative capacities are central to creativity and novelty. Supporting imaginative practices could help societies to engage with alternative futures and to identify actual means necessary to transform present arrangements to achieve them (Yusoff and Gabrys 2011).

The concept of imagination has been mobilized by a multitude of disciplines and a thorough review for the relevance in sustainability transformations is beyond the scope of this paper (Milkoreit 2016, Galafassi 2018). However, we can distinguish two primary ways of thinking about imagination. The first is imagination as a mediator between an ‘objective and empirically apprehensible world’ and the mind of an observer. In this view, imagination is an internal capacity of the mind set against the external material world (Markman et al. 2012). It functions as a filter to human perceptions. When applied to futures thinking, imagination, in this conception, is seen primarily as the power of creating images in the mind ahead of their material enactment (Markman et al. 2012).

The conception of imagination as a mediator has been criticized in various disciplines (Yusoff and Gabrys 2011). Drawing from the field of embodied cognition, education, arts and anthropology, our view takes imagination to be central to sense-making. Imagination supports integration of sense perceptions with memories and notions of future possibilities (Pelaprat and Cole 2011) – what we cannot see but need to explain and construct meaning about, we tend to imagine. Similarly, for Vygotsky (1980) imagination is “the process of resolving and connecting the fragmented, poorly coordinated experience of the world so as to bring about a stable image of the world”. Imagination is part of our sensory bodily experiences which in turn can transform our experience of the world, enlarge our conception of it and create new ways of making sense of our relations within it (Johnson 2008, Claxton 2015, p. 72). In this view, imagination is not a mediator, but rather an integral part of the relational experience of being in the world. Ingold (2015) defines imagination as “the impulse of life running ahead of itself”. In this way, imagination is seen as an active aspect of human experience in the world, central to how we anticipate, attend to, synthesize and generate meaning from our experiences in it (Brady 1998).

This perspective helps us to put in focus that imagination is not a purely abstract capacity of the mind, but rather an active process of engagement with the rest of the living world (Johnson 2008). Thus, imagination is not a power of creating mental representations of the future ahead of their material enactment, but rather a generative impulse of life towards new desirable ways of being in the world (Ingold 2015). To sum, we follow Yusoff and Gabrys’ (2011) definition of imagination as “a way of seeing, sensing, thinking and dreaming that creates the conditions for material interventions *in*, and political sensibilities *of* the world”. This definition implies that imagination can be understood as a way of sensing and knowing high-end climate change.

It is in this inexorable tangle between imagination and the senses that we position our exploration on the role of imaginative practices from the arts. To Eisner (2002), artworks play an important role in refining our sensory system and nurturing imagination. They do this by offering people a focused opportunity to attend to qualities of sight, sound, taste and touch and in order to experience things rather than just receiving a description. Similarly, Boal (2009) insists that crucial for the transformation of social consciousness is a form of non-verbal knowing he called “sensorial thinking”. In line with theories of embodied meaning in cognitive sciences (Lakoff and Johnson 1999), this view emphasizes how meaning grows from bodily perceptions, images, qualities, feelings and emotions (see also Johnson 2008, Damasio 1994).

Artistic practices display a rich repertoire for activating sensory and aesthetic ways of knowing (Boal 2009). Our exploration of arts-based approaches as a way to ‘restore the senses’ is aligned with the established evidence that only generating information about the problems of climate change is not enough to enact the necessary cognitive and emotional resources for transformative action (Leiserowitz 2006, Norgaard 2011, Moser 2014, Stoknes 2015). We see three key ways in which arts-based approaches may contribute to imagination in a HECC context. First, one of the difficulties with climate change perception and action is that it is generally felt as distant (either in time or in space) and hence grasping the urgency of such actions can be challenging (Spence et al. 2011). Art experiences have the potential to ‘bring climate change closer’ to include ‘experiences’ (emotional and embodied) and provide texture and meaning on which new ways of seeing the world can emerge. Secondly, art experiences open up intuitive and non-verbal forms of engagement, drawing on tacit knowledge and emotions as a key source of insight into the dynamics of complex systems (Eisner 2002; Greenwood 2011). In addition, arts-based inquiry, in its open-ended approach (as opposed to fixed solutions and outcomes) may reveal surprising connections and entice participants to apprehend aspects of the world that were previously taken for granted (Kagan 2010; Barone and Eisner 2011).

For instance, visions of the future cannot be derived solely from logic thinking; they are intrinsically related to preferences, emotions, motivations, ideals, and broad collective imaginations (Boulding 1956). Hence, a non-conventional approach that reaches beyond logical-deductive capacities (Kagan 2015; Heras et al. 2016) may be required to explore visions and strategies better suited to address the complex challenges of transformations in a HECC world.

## Envisioning high-end socio-climate futures in the Iberian Peninsula

### **Context and process: the ‘science-led’**

A participatory integrated assessment process was conducted within the context of the EU-funded project *Impressions* (Impacts and Risks from High-End Scenarios: Strategies For Innovative Solutions) with the aim “to work with decision-makers to improve understanding of the impacts, risks, vulnerability and adaptation options asso-

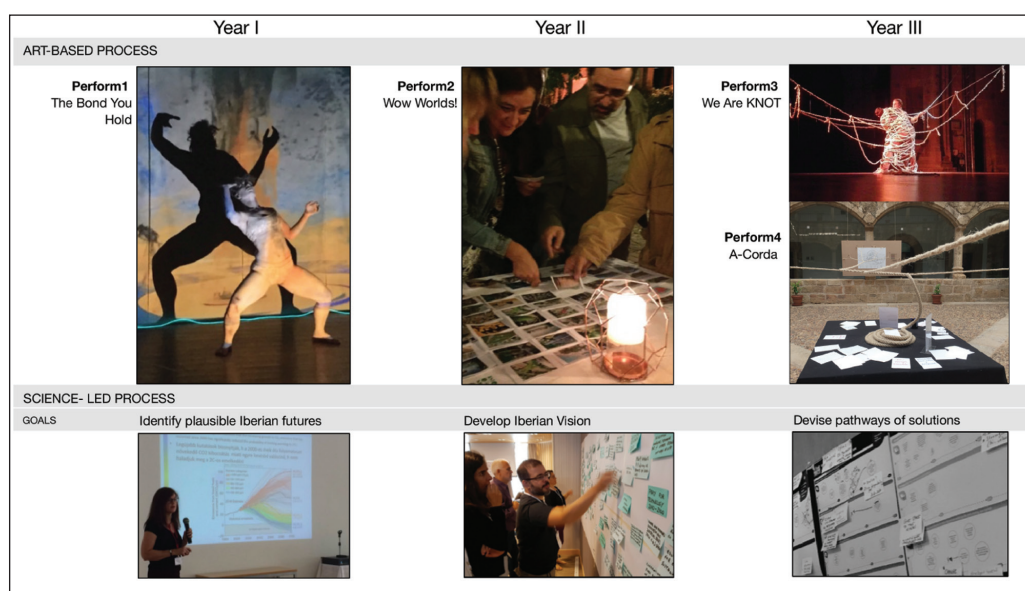
ciated with high-end climate and socio-economic scenarios”.<sup>2</sup> The process was designed to investigate transformative strategies to face a world going beyond 2°C of global warming. The project ran stakeholder workshops in five case studies at different scales (Hungary, Scotland, Iberia, Europe and Central Asia), complemented with a final workshop where stakeholders from all these case studies participated in the final strategy building. This paper focuses on artistic activities performed over three consecutive years in the Iberian case-study.<sup>3</sup>

For the Iberian case-study, 25 participants from Portugal and Spain (following the representativeness selection criteria in Gramberger et al. (2014)) were invited for an iterative process over three years. A total of three workshops of two days each were conducted in which government officials, practitioners, scientists, and civil society representatives explored social and ecological contexts, developed alternative futures and visions, and identified sets of transformative solutions. (Tàbara et al. 2017) has described in detail the process, led by scientists with the support of a team of professional facilitators. In Workshop 1 (WS1), that took place in 2015 in Lisbon, Portugal, participants worked to improve their understanding about the current system and devise a set of four plausible storylines scenarios for the Iberian Peninsula up to 2100. Workshop 2 (WS2), conducted in Summer 2016 in Toledo, Spain, was dedicated to the identification and development of a vision (desired future). The third workshop (WS3) in September 2017 in Cáceres, Spain, was oriented to discussion of pathways of transformative solutions to achieve the vision (**Figure 2**).

### **Arts-based Process and artistic activities**

Alongside the science-led process a number of arts-based activities were carried out by various artists, *Impressions* scientists (including the authors) and stakeholders (**Figure 1**). The artistic activities were planned separately to the science-led process by artists in dialogue with project scientists. One of us (JDT) has been involved in the design of both processes. The arts-based process followed the artistic tradition of open inquiry and was not aimed at “using” art to communicate different aspects of the project. Rather, it drew inspiration from the science-led process and worked reflexively with scientific goals, processes and outcomes, either by mirroring them, crystalizing or deepening – colloquially, we termed this process as ‘re-search’ to suggest the iterative and recursive nature of the artistic inquiry.

We adopted a range of artistic languages and practices from physical theatre, music, performance, film and installations. We utilized three guiding principles for this open inquiry. The first was the commitment to generate a specific artistic expression and aesthetical experience (here referred as ‘activity’) to coincide with each of the three *Impressions* Iberian workshops (**Table 1**). The second was that these activities would be participatory; and third, that they would have a strong component of reflection where participants would be invited to further assimilate the work from the science-led workshops through the qualities of the aesthetical experience. Detailed description of



**Figure 1:** Arts-based process (top four images, respectively Lisbon, Toledo, Cáceres) conducted alongside a science-led process (bottom three images) in the context of EU-project *Impressions*. The overarching goal of the four performances was to explore the potential role of arts-based approaches in supporting the design of transformative strategies for dealing with high-end climate change which was the overall focus of the participatory integrated assessment of the science-led process. Photos: Diego Galafassi. DOI: <https://doi.org/10.1525/elementa.330.f1>

each activity and a reflection on this process can be found in the Supplementary materials.

The artistic process was articulated around four artistic activities (more details in Supplementary Material). The first activity (Perform 1) was a physical theatre performance that took place in Lisbon in concurrence with the first Iberian workshop. Workshop participants attended the performance, which included a debrief session. Over a period of four months, we drew from practices of physical theatre, music, voxpop interviews (spontaneous video interviews) on streets of Stockholm, Barcelona and Lisbon and video projections to develop a physical theatre performance about transitions in the Earth's climate system. The key guiding question to this inquiry was, 'what does the experience of going through a transition feels like?' At the beginning of the performance each participant was given a paper tag where they were invited to reflect on their feelings about the future. During the performance, these tags were assembled together with a wire that bounded the stage, linking the performance story to the impressions of participants as a metaphor of the bonds we hold within our climate system.

The second activity (Perform2) explored the visual aspects of climate change through a range of visualization techniques to foster a reflection on the kinds of images that do and do not motivate participants' work within the climate domain, and images they hold about desirable futures. We used a series of reflexive practices including drawing, walking, journaling and a visual dialogue (an adapted form of visual q-method).

The third year had two activities: an interactive installation (Perform3), open to the broad public exploring the four possible Iberian futures (as devised by the science-led process) and a performance (Perform4) to *Impressions* stakeholders bringing together physical theatre, music and video projections. The goal of the installation was

to open up to the public the work conducted on the science-led process. Therefore, all elements developed in the science-led process (four Iberian future scenarios, the Iberian visions and the set of pathways towards the vision) were present in the installation, and the public was invited to contribute with their own views and ideas. The performance "We Are Knot" was constructed around the inquiry on the key aspects that catalyse and maintain 'willingness to act'. All participants were invited on stage where two performers were tied up with a complex knot of strings. As the performance progressed, participants began to collaborate to untangle the knot. Hence triggering questions about what to do while confronted with a difficult situation, why to engage in collective action and how to act in a real scenario of high uncertainty. The performance closes with a screening of images from different communities around the world who are already living with a radically changing environment.

#### **Data collection and analysis**

Our analysis is focused primarily on the debrief sessions that followed Perform1, Perform2 and Perform4 (Table 1). These sessions were facilitated by the authors, audio-recorded (total 182 minutes) and transcribed in their entirety. We followed a grounded theory approach of analysis (Charmaz and Belgrave 2007). Using our broad research question as an entry point, we first coded descriptively each passage (performed by the lead author using Atlas.Ti software) and identified quotations related to: i) experiential dimensions and perceived effects, ii) emergent topics of discussion, iii) contents of visions. A second iteration then compared and clustered initial codes into emergent themes that helped illuminating the potential and challenges of art spaces supporting the visioning of alternative futures. Illustrative quotes were selected to support the themes that we present in the analysis session.

**Table 1:** The arts-based activities conducted alongside the science-led processes in the Iberian case of project *Impressions* (detailed descriptions in the supplementary material). DOI: <https://doi.org/10.1525/elementa.330.t1>

Reference in this article	Description	Number of Participants	Duration and Location	Form	Title
Perform1	Multi-sensorial physical theatre performance about transitions in Earth system, embodying the dynamic relation between climate and humans in a world beyond 2°C warming.	25	35 min performance and 25 min debrief session. Performed once in Lisbon, Portugal July 2015	Interactive performance including two performers, music and projections.	The Bond You Hold
Perform2	In four visualization techniques participants were invited to reflect and express images about Iberian Peninsula futures.	23	Variable, occurring over a period of 2 days in September 2016 in Toledo, Spain	Visual arts, contemplative practices	WOW Worlds!
Perform3	A participatory installation occupying 400 m <sup>2</sup> of the cloister of San Francisco Cultural Complex. Four plausible Iberian futures were depicted and arranged within a rope construction. At the centre an interactive space invited visitors to contribute their dreams and visions for the future of the Iberian Peninsula.	Estimated daily average 20 visitors over 2 months. >1000	Open to public during September and October 2017, at San Francisco Cultural Complex in Cáceres, Spain.	Interactive installation	A-CORDA
Perform4	Interactive performance including two performers, music and projections. Starts with both actors and participants on stage, actors are 'bundled' in a complex knot of strings. As performance progresses participants self-organize to unravel the knot.	19	22 min performance and 62 min debrief session. First performed in Cáceres, Spain.	Physical theater, music and video projections	We are knot

Auxiliary data sources were the results of visualization exercises from Perform2 and public entries on Perform3 (i.e. participants' drawings, pictures, collective mural). Content analysis was performed in these images to identify their constituent elements. This involved coding of specific elements (using an Excel spreadsheet) and also an analysis of the image as whole (Leeuwen and Jewitt 2001). Direct observation (Denzin and Lincoln 2011) was conducted throughout the artistic workshops by attending and taking notes on participants' interactions and engagement in the performances. We also wrote journals in order to systematically engage our own emotional and intellectual responses throughout the process and after performances (Tenni et al. 2003). These insights from direct observation and journaling were used to support and contextualize the analysis of participants' inputs. We also compared the arts-based visioning with reports and published work that emerged from the science-led process (Tàbara et al. 2017).

#### **Reflection on roles, data and analysis**

As often within arts-based research (Leavy 2015, 2017), we have followed a qualitative, inductive approach to data generation and analysis that could allow us to grasp the complexity and open-ended nature of the aesthetical experiences. In this regard, this research faces similar challenges to other forms of participatory and collaborative knowledge creation. The generated insights (that is, the interpretations of meanings rather than 'positive facts' and processes) are highly situated, context sensitive and contain multiple perspectives. Our analysis is focused on understanding the various epistemological and aesthetic aspects that these artistic activities bring to visioning and the construction of transformative strategies. Therefore, the fact that only a small number of participants have been present throughout all artistic activities does not compromise the results presented.

As part of a transdisciplinary research process, the authors have played multiple and at times overlapping

roles. Following Wittmayer and Schöpke's (2014) distinctions of roles, we have been "process facilitators" by co-designing the process and facilitating activities. We also played the role of the "reflective scientist" by collecting, analyzing, interpreting and reporting data presented in this research. The switch between process facilitators and reflexive scientists occurred at the end of the performances, when debrief sessions started, and afterwards when analysing their outcomes. Within the given context, we sought to avoid framing the conversations hence allowing for the open exploration of the possibilities of such approaches and inviting participants to reflect on these art-science interfacing activities. Given the fact that positive and negative aspects were raised, we have reason to believe participants' opinions were not necessarily hindered by the multiple roles played by the authors.

**Presenting the Challenges of High-End Climate Change**

In this section, we introduce emerging themes from our analysis of how arts-based modalities of engagement may support the process of imagining alternative futures and developing transformative strategies to address a high-end climate world. Emerging themes revolve around the ways in which the artistic experiences were drawn into meaning making, the role of more-than-rational knowing and how these experiences may affect group trust, sense of identity and issues of uncertainty and ambiguity. We then reflect about the implications of these elements for collective visioning exercises and the devise of transformative strategies of action.

**Imagination and visioning through art experiences**

One of the most striking patterns we observed in the debrief sessions after Perform1 and Perform4 was the way in which participants draw out linkages between the shared art experience and the challenges of climate change. The materials, dynamics and elements of the performances were 'activated' by participants during the debrief to discuss and illustrate an understanding about a particular topic. In these debrief sessions, participants were not only interpreting the art experience in and of itself, but rather engaging in a collective imagination linking and finding patterns between the various performative

elements and their own domain of climate change action. The emerging meaningful connections add texture to knowledge and function as anchors for future reasoning. For example, during debrief of Peform4 one participant made the connection between what was experienced during the performance and how climate responses involve future trade-offs,

*"It was interesting when the bodies [of the actors] were falling as a result of our untangling. This is like climate change because there is a lot of discussions, some arguing that a certain action needs to be done, and others are saying that it might not be a good action because it will have all sorts of trade-offs and other impacts."*

– Participant, Perform4

**Table 2** reports the range of topics that emerged in the debrief sessions. Sometimes the discussions extended the conversations that emerged in the science-led process. For example, one of the participants reflected on the dynamics of collective action based on how the group started to participate in Perform4,

*"In this performance, some leaders take the decision to untangle and others go behind and act, not just look, we act. We're not told what to do. And then there is a curious thing that happened, when everything was untangled the leadership also disappeared. Nevertheless, something happens in the performance that we all end up together facing reality."*

– Participant, Perform4

Imagination is central in this process of establishing the link between the experience, material elements of the performance and a particular aspect of climate knowledge, e.g. leadership and trade-offs in the examples above. A shared vivid experience such as this provides the grounds for the emergence of shared meaning or at least a provisional agreement on particular meanings. They bring together the expressive of the aesthetic experience and the conceptual explorations of the science-led process. By allowing each one to understand in their own intimate ways, they also open up concepts to be multidimensional.

**Table 2:** Climate-related topics that were brought up during debrief of performances. DOI: <https://doi.org/10.1525/elementa.330.t2>

Climate-related themes that emerged	Performance
Climate responses	Perform 1
Colonialism	Perform4
Leadership	Perform 1, Perform4
Dynamics of collective action	Perform4
Understanding the will to act	Perform4
What hinders transformative thinking	Perform 1, Perform4
The power of understanding the problem	Perform4
Agency	Perform 1, Perform2, Perform3, Perform4
Visions for the future	Perform2, Perform4

### **Trust**

In both Perform1 and Perform4 several participants reflected on the sense of trust that emerged in the group as they experienced the work together. The performances had two distinct moments, an evocative moment of the aesthetical experience and a second moment of reflection and sharing during debrief. The combination of unique individual experience and the collective space of disclosure of these experiences – which often requires generosity and vulnerability – seem to contribute to a sense of trust,

*“When we started to take away the string, we did it all together, one passes the string to another.. this contact of one to another, it seems to me that it favours this union that we look for. Everyone participating in the workshop that will disentangle this mystery ahead of us in all of these years. It created a powerful image of doing things together, not only thinking or talking about it, but doing it.”*

– Participant, Perform4

As opposed to techniques of dialogue that emphasize logical arguments, arts-based dialogue seemingly created communication beyond words (through acting and interpersonal attention). The arts-based dialogue seemed to have created a “slower pace” and a more open way of speaking and reflecting on one another’s experiences thereby fostering a more equal interpersonal dynamic amongst participants. Participants acknowledged in the conversations that everyone’s experiences of the performances were valid and in that way hierarchies were not accentuated.

### **More-than-rational knowing**

Another striking pattern we observed was the way the art experiences elicited a range of emotional responses and became a channel for engaging other modalities of thinking and feeling. Participants seemed to have acknowledged the links between these modalities of engagement and more objective forms of knowledge,

*“You have managed to break the impenetrable wall that separates the epistemology of the rational knowledge and the intuitive knowledge based on emotions. A fleeting contact, but very valuable. I do believe that your proposal could be very useful in processes of planning and citizen empowerment.”*

– Participant, Perform 1

This suggests that these spaces might trigger a form of knowing and learning not confined to a logico-rational frame, identified as relevant by scientists and practitioners. These include aesthetic elements, affect and subjective experiences that can at times be hard to put into words (Dieleman 2008). These more-than-rational elements seemed also to expand the range of connections to the non-human world and at times generated nuances to explicit knowledge that one is already familiar with. For example, a climate scientist mentioned,

*“I saw that graph many times, you know the Earth breathing in and out.. and higher and higher and it is the first time I really felt it, other than analytically – see it how much ppm is on one axis and years is on the other – so it created very strong emotions actually.”*

– Climate scientist, Perform 1

### **A larger sense of the challenge and of self-identity**

Another aspect of these more-than-rational modalities of knowledge, is that they seem to ‘bring climate change closer’, in the sense of bringing the issue to more existential and deeper questions, without being intrusive,

*“it affected me emotionally far, far more than what I was expecting... there was complete pressure at one point and all I could think of was my children. I thought it was absolutely amazing. But I think there was a little bit of hope at the end. I hope... that’s what I’m holding on to.”*

– Climate scientist, Perform 1

*“It allowed the heart to speak rather than the mind. It made me rediscover why I’m actually in this line of work.”*

– Participant, Perform 1

### **Embracing paradoxes and ambiguities**

Perform1 explored, via body movement and music, the tensions and dynamics that emerge when complex systems undergo transitions (Scheffer 2009). Several participants commented on the mix of feelings between hope and anxiety that they felt during the performance. One participant reflected that this mixed experience (not totally positive, nor negative) helped him to incorporate and reflect on the paradoxical nature of climate challenges,

*“It took me to a world, and made me feel situations at times contradictory. The hope and the preoccupation... seeing the positions of each other here. It made me internalize many aspects, especially here with people I have only met 24 hours ago.. it brought us a little closer.”*

– Participant, Perform 1

We observed that often times, it was difficult for participants to put the experiences into words. Another participant shared how she was moved by the combination of these ambiguities presented,

*“Polarity also between anguish and contraction and the beauty of Earth and the hope that in some way it will continue. I hope with us, otherwise without us.. but this beauty.. no.. we are not able to destroy.”*

– Participant, Perform 1

### **Restoring the senses: from images of the future to infused action**

What we presented so far suggests artistic activities played various roles in developing and activating participants’ multiple senses and more-than-rational ways of knowing. These are often neglected by the use of

more conventional and instrumental rationality research methods and approaches. To ‘restore the senses’ does not imply a return to an original condition of perception and relation to the world, but rather it entails an extension of learning capacities. It means to bring more than analytical capabilities to bear onto the tasks of tackling challenges of climate change. Through embodied, aesthetic and imaginative practices, multiple sources of knowledge may become available as part of the process of visioning.

Visioning is commonly thought of as a process of co-creating an image of a desired world in which a group of people would engage and work towards. It is a projection of a fully-formed image into the future. The assumption here is that once the group manages to agree on a common picture, visioning is completed and implementation can begin. In short, in this perspective the process of visioning is about negotiating and agreeing on an image of the world to support mobilization that can lead towards such image (Figure 3A).

Our arts-based approach however brought into focus the micro-mechanisms through which visioning processes operate. Results from the visual dialogue where participants were invited to reflect on empowering and disempowering images (Perform2) suggests that participants do not necessarily have a fully-formed image of a desired world or at least an explicit one which can be clearly expressed. Instead, visions are dynamic. Some of their aspects can be brought into awareness by certain practices. However they can shift and depending on who participates in the process, the kinds of expressive resources they have at hand and how open and facilitated are the processes of developing visions.

We observed that by exploring climate change through the aesthetic experiences of the performances and imagining various futures, participants could experience positive and negative aspects of these futures. Through this process they progressively developed ‘a sense and a

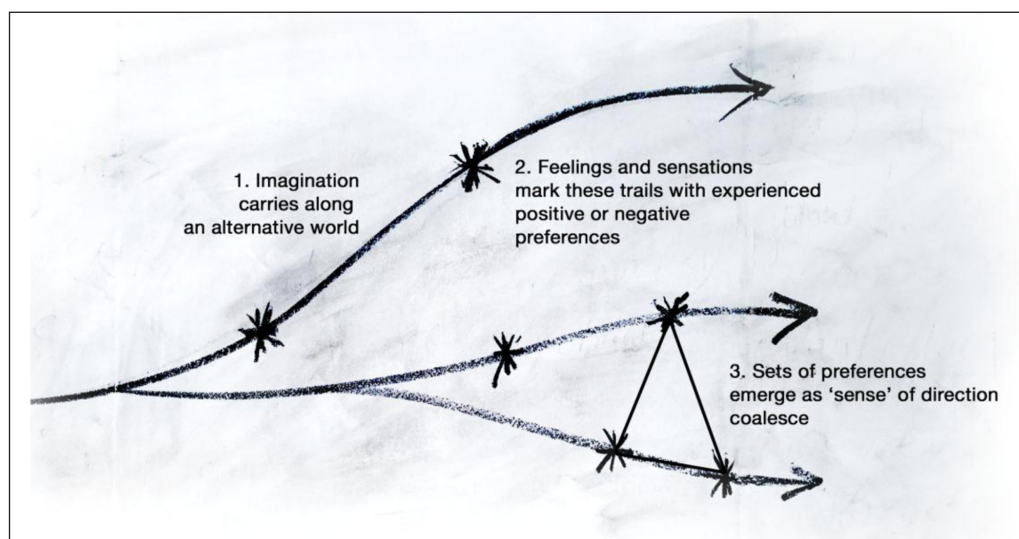
feeling’ for what kind of future they would like to work towards. Hence, visioning here is about treading through imaginative paths to discover “a sense” for how things are going and how one might like to shape them towards another direction (Figure 2). One of the participants said during Perform2 while explaining the sorting of images of the world,

*“These are negative images that I know we have much to work on. But most importantly, I get energized by these [other] images that makes me feel connected to something larger than life”.*

– Participant, Perform2

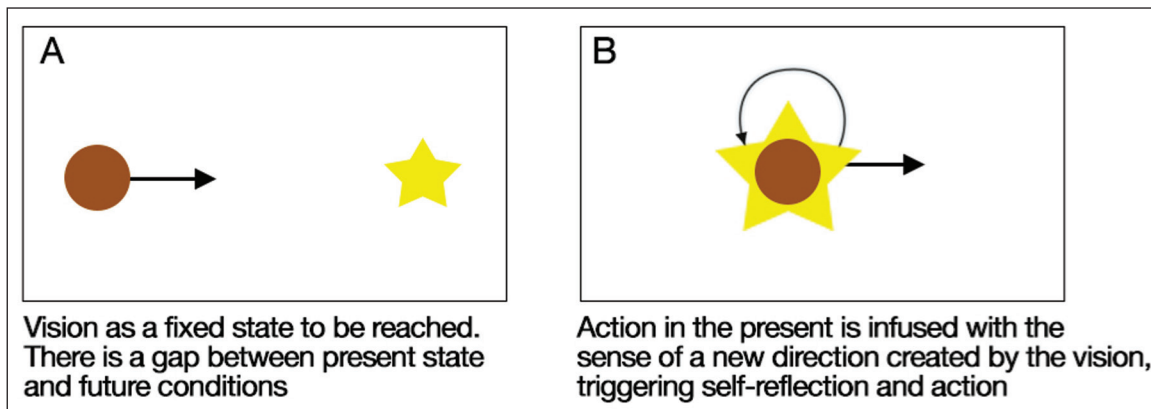
In this light, visioning then is not something one does once and for all (as in forming an image), but rather it is a continuous process of making the future present in order to discover preferences towards certain futures and taking actions in the present towards an evolving purpose (Figure 3B). It is about generating inspiration and infusing action with the necessary impetus to open up a new trajectory.

The role of the imagination in this perspective is to bring the future to the present so that participants can develop a relation to the future: “is this a future I would like to live in? What aspects of this future align with my preferences? What new possible preferences does this experience reveal to me?”. By experiencing these alternatives, a meaningful “sense of direction” might begin to form as one identifies with certain aspects of a desirable future. This “sense of direction” is founded on values, ethical principles, images – in short more-than-rational aspects – that can come together through these experiences. The sense of direction developed in this visioning infuses action with principles, not necessarily solely articulated at the discursive level but importantly also at an emotional level, and helps one to differentiate between different courses of action at hand. A participant said during Perform4,



**Figure 2:** Aesthetic experiences can foster imagination of alternative conceptions of the world (arrowed lines). The embodied process of thinking and feeling within these different conceptions of the world can lead to the generation of “a sense” for a new direction of action. This sense of direction can be seen as a precondition for visions and the formation of transformative strategies. DOI: <https://doi.org/10.1525/elementa.330.f2>





**Figure 3:** Two ways of conceptualizing visions. **A)** vision as formed image; **B)** vision as infused action. DOI: <https://doi.org/10.1525/elementa.330.f3>

*"If we decided to act [to untie the knot during the performance], this is not because we carried out a multi-criteria analysis of the situation; we did so, rather spontaneously because we felt we had to do it so we did".*

– Participant, Perform4

Discovering this sense of direction involves also self-reflection on personal identity in relation to actions, as one of the participants suggested,

*"..we here, we are like the chosen ones – now we're going out there, and remembering that we're the chosen ones and we have a mission."*

– Participant, Perform4

Here the participant captured a sense of purpose felt at that moment and a feeling of being part of something together with others which can reinforce that sense of purpose.

We do not claim that defining goals is not an important and necessary task. However, our research shows that practitioners are challenged with a difficult task of envisioning the future in the face of the complexity and highly uncertain context of HECC. Acknowledging these difficulties is a step towards enhancing processes of goals definition. We also do not suggest that this task of imagination should then be left to a few gifted ones. To the contrary, imaginative capacities need to be boosted across all those engaged (and arguably the wide public too). Our research pointed out that instead of something societies do once and for all, there is a potential of approaching visioning as a dynamic effort of exploring alternative futures through sensory and aesthetic engagement that may progressively yield a sense of direction. Arts-based approaches have an extensive repertoire of practices to support this task.

### The search for transformative strategies

Finally, if imagination and experience work together to generate a sense of direction and purpose, then how can transformative pathways be distinguished from pathways that perpetuate current systems and dynamics? A full comparison between the science-led and the arts-led process goes beyond the scope of this paper. However, we noticed one remarkable distinction in the way these

processes triggered different imaginative processes. The science-led process generated a common vision for Iberia and other case studies through a step-by-step analytical process of collaborative efforts between participants and scientists. In analysing this resulting vision we noticed that many of the desired components of the vision were expected to be achieved without radical changes in the present system configurations and therefore would simply take the current system and imagine it as gradually improved. This difficulty to conceive the nature of the non-linear changes required in current global complex systems under HECC ignores critical aspects such as emergence and self-organization. For example, one aspect of the vision for 2100 in the science-led process was defined as "sustainable resource management, high levels of environmental protection and less pollution", which can be interpreted as a direct response to current unsustainable resource management and low levels of environmental protection and high pollution in particular areas of the Iberian Peninsula.

The search for transformative visions is, thus, a key challenge to current research in transformations towards sustainability (Bennett et al. 2016, ISSC et al. 2016). Visions and strategies that tend to project the betterment of the present conditions to the future, may limit the kinds of solutions that can be pursued. In the other hand, transformative visions reveal completely new conditions in which future societies could be developed and therefore might open up the imagination to ideas of novel connections for resources, institutional changes, and possible actions.

The artistic spaces opened up imaginative processes that we speculate might be related to the development of transformative visions. For example, the ability to imagine climate change beyond a technical problem which in itself requires new modes of thinking and feeling,

*"I think this kind of work would be very appropriate in climate negotiations so that negotiators could open up to search for solutions with their whole being, not only with reason and therefore get out of the 'comfort zone' that leads to 'business-as-usual' and do not bring about the transformations that the world needs."*

– Participant, Perform1

Transformative visions are not about utopias or out-of-reach fantasy. Following from our discussion on infusing action, transformative visions are about opening up the range of possible pathways in the present. For instance, if one envisions “full employment” action may be restricted to improving the current system. But if the vision encompasses a transformation into a new system of understanding and using human time and creating value in a completely different way, a myriad of other possibilities of activity can open up to present action.

However, when we asked participants to draw images of (or write about) the world they would like to have as part of the vision, we received surprisingly similar pictures. The majority portrayed equality in society and harmony with nature; and a somewhat nostalgic “back to origins” narrative could be identified. This is a common finding in visioning processes and authors have discussed the difficulties of imagining a future system in particular in the highly dynamic and non-linear world of the Anthropocene (Bennett et al. 2016).

While our arts-based approach gave access to this difficulty, it also suggested new promising avenues. One of the participants for instance suggested that there seems to be a crucial possibility for instilling creativity and serendipity in co-creation processes to help catalysing transformative visioning,

*“We need to do this [the performance] at the beginning of the workshop, it could develop more the creativity of the [science-led] workshop. Because it may be that it frees you, and that gives you a space of initial creation (another agrees: yes!), it is like it cleans the mind. Through the art we clean the mind, you see, it is like it de-contaminates.”*

– Participant, Perform4

The process presented in this paper demonstrates some of the ways in which arts-based activities, in participatory integrated assessment processes, may foster new ways of sensing, experiencing and anticipating the future in conditions of high uncertainties and high stakes. Our process seemingly supported what we called *infused action*, i.e. making the future present in order to create the necessarily emotional and intentional predisposition for acting towards a new direction.

### **Challenges of arts-based approaches**

Although our experience has pointed out important areas of unique contribution of arts-based approaches in climate integrated assessment processes, our case highlighted a range of challenges. The first is scalability and the difficulties of replicating performances. Although the installation (Perform3) was open to wider audiences that seemingly extended the science-led process, opening performances to larger audiences involves logistical issues that need to be accounted for. Another challenge is that artistic productions tend to be resource intensive and require particular sets of skills that may not be readily available to many projects focusing on science-for-policy development. In our case, it has been important to work with professional artists to build on grounded experience in performative fields.

A research design integrating from the onset of the project the scientific and artistic activities can contribute to identify needs, potential to ensure the feasibility and reinforcing the quality of interaction between arts-based and science-led processes. The integration of arts-based approaches hinges also upon how well the art experiences resonate with or challenge the questions asked in science-led processes, thus prompting acts of ‘re-search’. Paradoxically, providing greater degrees of freedom for exploration is arguably one of the important contributions arts-based approaches can bring to knowledge and value co-production and integration. Yet another challenge is that tracing effects of arts-based experiences. With the methods used in this research we are not able to discuss individuals’ behavior change as a result of their engagement with arts-based activities. Instead, our results provide evidence for some of the ways in which arts-based approaches can support reflectivity in the processes of designing transformative strategies and in particular the visioning of climate transformations.

However these are early days of this field and there are still several areas that need attention. Importantly, there is a need to further develop analytical frameworks to understand and trace some of the effects of these spaces and techniques. This requires thinking beyond objective measures of outcomes, to address also the crucial role played by individual and group experiences. This is a challenging domain since artistic practices are by definition (and virtue) not necessarily bounded to well-defined outcomes and problem-solution framing. Allowing space for interaction of scientists and artists is important for the development of a shared understanding of one another’s practices and approaches. This might generate a more realistic approach and guard against instrumental uses. Tracking effects is difficult and perhaps the arts should in fact remain at the edge of explorative efforts, providing place/topic-specific inquiry, without being tied to particular expected outcomes. If that is the case, conceptual ground should be opened within knowledge co-creation projects based on accounts of experiences of arts-based approaches such as the one we reported here.

### **Conclusion**

The future in the Anthropocene under high-end climate change may be radically different, defying human imagination in a profound way. Our starting point has been the growing realization within sustainability science that conventional methods are not sufficient to bring about the kinds of transformations and to support the building of social capacities needed to deal with high-end climate change challenges (Lövbrand et al. 2015; Maggs and Robinson 2016). This invokes the need for alternative ways of knowing, feeling and sharing experiences that help actors from multiple contexts to come to grips with the uncertainty and nature of risks that a HECC world would entail. In this paper we conducted and analysed a set of arts-based activities, including performances, visual methods and exhibition, to gain insight on how aesthetic and imaginative experiences may foster imagination and support the co-production of transformative strategies and especially the visioning of alternative futures in the context of high-end climate change.

Analyzing a diverse suite of arts-based practices, our study shows three key contributions to the imaginative engagement with high-end climate change. First, the embodied, imaginative and aesthetic experiences supported participants' inquiry into more-than-rational elements of visioning. Visioning intrinsically involves engaging with emotions, values and ethical commitments. Visions that not only project the betterment of current conditions need to find ways to engage with deep-seated assumptions. The arts-based approach allowed us to bring about new modes of engagement based on aesthetical experience, unlocking imaginative and learning potential. It is clear that the process of transformative visioning involves both rational and non-rational components which cannot be separated – nor need to.

Second, the various artworks afforded shared experiences that were useful both as a source of meaningful conversations and realizations and also important to build trust in the group of participants in a relatively short period of time. These experiences seemed to function as anchors for future reasoning. The work has demonstrated that artistic experiences can elicit powerful experiences that are recognized as important by participants. The ways in which these experiences may connect to long term shifts in perspectives and behaviour however is an area that requires further research.

Thirdly, the combination of science-led and art-led processes within this large-scale climate change project helped us to articulate the role of visioning *as a process of making the future present* that creates the possibility to develop a “sense” of oneself in relation to a HECC future to support action. In this manner, visions are not seen as end-points or final images in people's minds, but rather as a process of *infusing action* and developing an enhanced and widening sense of purpose on concrete transformative strategies. This suggests imagination as a primary source for sustaining the impetus of creating new social-ecological trajectories in a world that is teeming with ambiguity, uncertainties and paradoxes. Imagination can help developing a sense of purpose, ownership and the emotional and cognitive dispositions to shape a better future. Importantly, the development of such a “sense of purpose” is just one aspect of a much broader process of change (Moore et al. 2014).

Engaging with climate change through artistic practices revealed climate change as multi-dimensional (not only a technical problem) and focused on people as a solution rather than the cause of the problem thereby triggering a range of latent capacities and empowering participants to take ownership of the future (Heras et al. 2016; Moser 2016). Arts-based approaches are uniquely placed to foster collective imagination, social energy and empower participants with motifs that may be used to spark collective transformative action. However, realizing these potentials will require wider and more intensive forms of collaboration, between sciences, arts and practitioners. Co-design between artists and scientists has been a key element of the approach. We argue that fruitful collaborations can emerge if artistic activities are not seen simply as a mere communication strategy, but rather as challenging the underlying assumptions about the nature of knowledge as

well as extensions and at times substitutions of the original designs of learning experiences aimed at fostering collective capacities to deal with HECC.

Importantly, to reconfigure the possibilities of novel social-ecological trajectories, capacities of the imagination should not be exclusive to artists, scientists or politicians, but to all those involved in the numerous responses to climate change across institutional scales and in society at large. Through arts-based imaginative practices, participants can potentially help re-create how alternative conceptions of the world might be. In this project, we explored what we regard as one of the key contributions of arts-based approaches, that is to help developing human sensibilities towards not only the impacts of environmental change but also towards the ways in which social-ecological arrangements and individual identities need to be reconfigured to open up new trajectories for transformation.

We see wide opportunity to explore artistic practices in processes of knowledge production of open and inclusive nature (Fazey et al. 2018, Tàbara et al. 2013; Cornell et al. 2013). A central challenge in addressing climate change is how to create open spaces for wide participation in the making of true and engaging transformative visions for a better world, which infuse both personal and collective actions in the present and increase our chances to solve the ultimate cause of climate change: the unsustainability of the present model of society.

### Supplemental file

The supplemental file for this article can be found as follows:

- **Text S1.** Art-science approach and ethics, description of the artistic activities, summary of methodology and research process, and supplementary results. DOI: <https://doi.org/10.1525/elementa.330.s1>

### Notes

- <sup>1</sup> *Impressions* stands for ‘Impacts and Risks for High-End Climate Change’. [www.impressions-project.eu](http://www.impressions-project.eu).
- <sup>2</sup> On first insights and discussion on transformative solutions in the context of HECC see ‘Policy Insights’ In: Berry, P.M., Betts, R.A., Harrison, P.A. and Sanchez-Arcilla, A. (Eds.) 2017. High-End Climate Change in Europe. Available at: <http://highendclimateresearch.eu/>.
- <sup>3</sup> We also conducted artistic activities during the Final Workshop, however the data presented in this paper focuses only in the artistic activities of the Iberian case-study. The artistic activities, including those of the Final Workshop, have been discussed in Tàbara, Jäger, Harrison et al. (2018), which further extends the discussions and insights of this paper.

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### Competing interests

The authors have no competing interests to declare.

### Author contributions

DG and JDT have co-designed the art-science process and research strategy throughout the process. MH has co-designed the 1<sup>st</sup> year activity. DG and MH co-led the artistic concept and production (year 1) and DG has led artistic concept and production (year 2–3). JDT has contributed to art concepts across the process. Data acquisition and analysis: DG (year 1–3) and MH (year 1). Data analysis and interpretation: all authors. DG drafted the article, MH and JDT have revised it critically for important intellectual content. All authors approved the submitted version for publication and recognize no competing interests.

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