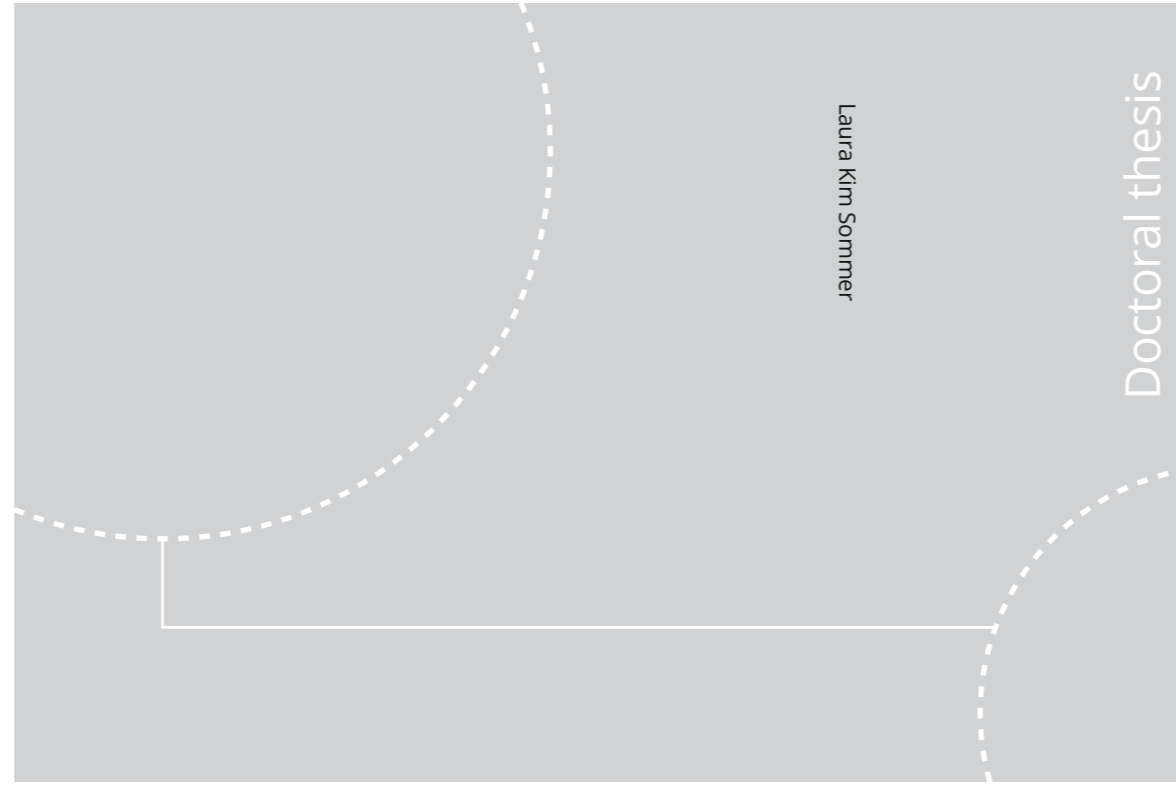


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Laura Kim Sommer

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An environmental psychological approach on
climate change communication through art

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Abstract

“EARTH’ without ‘ART’ is just ‘EH’” (Banksy)

an environmental psychological approach on climate change communication through art

Art has always been at the forefront of societal changes and is often described as a catalyst for change. Environmental artists are trying to raise awareness for and create engagement with one of the biggest challenges humankind is facing – climate change. However, research on the effect of these alternative methods of climate change communication is limited. This dissertation set out to fill this gap, by providing a psychological approach to evaluating the effectiveness of climate change communication through art. First, the artistic field is outlined by giving a working definition of environmental art, including climate change art as a subfield and describing the history of environmental art since the 1960’s - when the Land Art movement arose. Afterwards, four empirical studies are presented drawing on theory from art perception and environmental psychology and making use of the diversity of contemporary environmental art.

Characteristics of effective environmental artworks were identified in Study 1 and a model of environmental art perception predicting support for climate change policies was formulated and tested in Study 2. The first and second studies were based on questionnaire data collected at a climate art festival, ArtCOP21, which took place in parallel to the climate change negotiations in Paris in 2015 with N = 872 participants and 37 artworks. Next, using data collected under laboratory conditions in Germany (N = 123 participants), Study 3 tested the effect of the experience of one particular piece of art and contextualizing information on pro-environmental intentions and behaviour. Finally, Study 4 presented a special case, in which cognitive and emotional reactions of visitors to an art installation and the association of these reactions to behavioural intentions were assessed. The art used in this study was solely created for the current project, whilst taking findings from Study 1 and 2 into consideration. Study 4 used data collected at two locations where the art installation was exhibited: Trondheim, Norway and London, United Kingdom (N = 2662 participants).

Results from Study 1 showed that all 36 pieces of art (37 minus one outlier) could be assigned to four different clusters according to participants’ emotional reactions. The four clusters that emerged were “the comforting utopia”, “the challenging dystopia”, “the mediocre mythology” and “the awesome solution”.

The model formulated and tested in Study 2 indicated that the environmental art exhibited at ArtCOP21 was associated with spectators’ positive and negative emotions, and cognitions related to the topic of the art. These cognitions were subsequently related to support for climate change policies. The cognitions involved: 1) an identification with the artist, 2) an appraisal of the quality of the piece of art and, 3) reflections on the topic of the piece of art and the personal relevance of this topic to the individual.

Results from Study 3 showed that, when information on the artwork and its topic was provided, participants reacted more emotionally and perceived the art to be more meaningful, interesting and liked it more. However, providing information did not affect pro-environmental behavioural intentions or behaviours.

In Study 4, participants at both locations had strong intentions to act on climate change and air pollution prior to visiting the art installation and these intentions slightly increased after visiting the installation. Reported increases in intentions were positively related to negative emotions, such as “sadness, helplessness, and anger” and cognitions, such as “awareness of consequences”, “ascription of responsibility” to themselves, and “relevance for daily life”. Positive

emotions predicted changes in intentions when controlling for the aforementioned negative emotions and cognitions. Behavioural intentions, however, did not lead participants to track their carbon emissions or engage in potential pro-environmental behaviour via an online platform after the experience of the art installation.

From the arts side, the “Pollution Pods” turned out to be a successful piece of environmental art, in terms of the number of individuals who saw the installation. To date, over 30,000 visitors have experienced the Pollution Pods in nine locations around the world, and more than 100 media outlets have reported on them, including the New York Times, The Guardian and Die Zeit.

Overall, this dissertation contributes to transdisciplinary research at the intersection of climate change, environmental psychology and activist, environmental art. The measurement of pro-environmental intentions and behaviour did not come without methodological difficulties and it is important for these to be addressed in future research. However, the findings indicated that environmental art opens a space of reflection for the spectators that enables the viewers to establish a personal connection between themselves and climate change. This reflection process is what differentiates environmental art from other means of climate change information or education. Based on the results of all four studies, recommendations are given for artists and climate change communicators who want to increase the impact of their creative practice or campaigns.

Keywords

Climate Change, Art Perception, Environmental Psychology, Environmental Art, Emotions, Cognitions

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List of Publications

The following published papers are included in this PhD thesis. As the author, I would like to thank my co-authors, editors and reviewers for the comments during the submission and publication process.

Paper 1

Sommer, L. K. & Klöckner, C. A. (2019). Does activist art have the capacity to raise awareness in audiences? – a study on climate change art at the ArtCOP21 event in Paris. *Journal of Psychology, Creativity & the Arts*, Advance online publication. <https://doi.org/10.1037/aca0000247>

Paper 2

Klöckner, C. A. & Sommer, L.K. (to be submitted). And once more with feeling – What role does visual art play in motivating people to climate action?

Paper 3

Keller, A., Sommer, L. K., Klöckner, C. A. & Hanss, D. (2018). Contextualizing Information Enhances the Experience of Art. *Psychology of the Aesthetics, Creativity and the Arts*. Advance online publication. <https://doi.org/10.1037/aca0000213>

Paper 4

Sommer, L. K., Swim, J.K., Keller, A. & Klöckner, C. A. (2019). “Pollution Pods”: The merging of art and psychology to engage the public in climate change. *Global Environmental Change*, Vol. 59, 101992. <https://doi.org/10.1016/j.gloenvcha.2019.101992>

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Synopsis

“Earth’ without ‘art’ is just ‘Eh’”

Banksy

Art fulfils many functions in human society: it tells stories of how we want to be (Leppert, 2019, p.1), it is an emotional mirror, projecting the artist’s feelings (Foster & Blau, 1989, p.69), and it leads to an awareness of societal challenges (Chalmers, 2019). Since 1960, more and more artists are telling the story of the destruction that comes with anthropogenic climate change (Wallen, 2012), trying to create engagement with the topic (Nurmis, 2016). However, there is little research on how environmental art, and specifically, art depicting climate change, affects its audience and whether it can stimulate this audience into action.

This dissertation presented a psychological approach attempting to shed light on the effect that environmental art can have on its spectator’s emotions, cognitions, pro-environmental intentions, and behaviours. Studies conducted to date have shown that art may trigger emotions, whilst disseminating scientific information from researchers to practitioners and citizens, thereby creating engagement (Arce-Nazario, 2016; Baldwin & Chandler, 2010, Curtis, Reid, & Ballard, 2012; Marks, Chandler & Baldwin., 2016). In addition, art stimulates positive and negative emotions towards nature (Marks, Chandler & Baldwin, 2017) and has been used effectively to engage groups in discussions on climate change (Baldwin & Chandler, 2010; Grant, Baldwin, Lieske, & Martin, 2015). This suggests that climate change art has the potential to go beyond mere communication of the issue, moving citizens from awareness, concern, and understanding to possibly even action: a hypothesis that this project explores.

Research for this dissertation was conducted under the umbrella of the transdisciplinary Climart project, including psychology, natural sciences and art. Through the whole dissertation, theory and findings from environmental psychology and art perception are incorporated to extend the already existing efforts of researchers, environmental artists and campaigners . The project culminated in commissioning an artist to create a piece of art to communicate the urgency of climate change. The result was the “Pollution Pods” by Michael Pinsky, which was empirically evaluated in the final study.

My role as PhD candidate within Climart was to design surveys together with the other environmental psychologists on the team, collect and analyse data (on which Study 1 and 2 are based) and write the first paper as first author, and the second, as second author. In Study 3, I provided advice on the theoretical framework and contributed to writing Paper 3, as second author. In Study 4, I fulfilled the role of project manager and curator of the Pollution Pods in Trondheim and as researcher conducting data collections, both in Trondheim and London. As project manager and researcher, I worked closely together with the artist, Pinsky. Also, I wrote the first paper, as first author, investigating the emotional and cognitive reactions visitors showed to the Pollution Pods. Given my various roles and diverse collaborations with co-authors and research assistants, the use of “I” and “we” varies in this dissertation, based on which role I assumed.

This dissertation was structured in the following way. First, a definition of environmental art was given together with an overview on the history of environmental art since 1960. A lot can be learned from the evolution of environmental art as a field, and influential artworks within. This overview sets the scene for the artworks under investigation in the following four empirical studies. Figure 1 illustrates the main topic of each study and the art under investigation. For each study, the approach and findings were presented in connection with the other studies and relating to the initial question: “does environmental art, including climate change art, create engagement with the topic and increase viewer’s policy support, environmental intentions, and behaviour?”

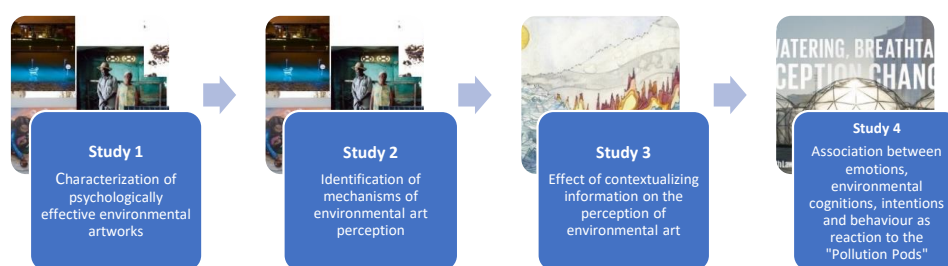


Figure 1 Flowchart showing the four studies comprising this dissertation, the artworks investigated in each study, as well as the main topic of each study

Study 1. Study 1 examined the characterization of ‘effective’ environmental artworks. Data collection took place at a climate art festival, called ArtCOP21, which happened in parallel with the 21st UN climate change negotiations in Paris. This festival exhibited a wide range of different artworks and allowed an exploratory investigation into what characteristics of an environmental artwork make it impactful for climate change communication.

At the festival, questionnaire data was collected from 872 participants as they reflected on 37 pieces of art. Theory from art perception suggested that participants would show an emotional and a cognitive reaction to the artwork (Silvia, 2013; Locher, 2015) which I assumed to consist of negative and positive emotions, as well as reflections relevant to the environmental context. For each piece art, the researchers identified characteristics such as the style, colour and material used by the artist.

Next, cluster analysis was used to find psychologically meaningful types of art according to the emotional reactions people showed in response to the art. That is, all pieces that caused similar patterns of emotions in spectators were put together in distinct clusters. Cognitive reactions were then compared between the clusters whilst common features of artworks within the clusters were identified from the previously noted characteristics. The different clusters were named based on audiences’ emotional and cognitive reactions as well as the characteristics of the art.

The analyses indicated that there were four distinct clusters. Cluster 1, “the comforting utopia”, triggered mostly positive emotions, few reflections and consisted of all participatory pieces of art, plus pieces that were more colourful and had the topic of a utopian future, among other characteristics. Cluster 2, “the

challenging dystopia”, on the other hand led people to feel negative emotions, confronted and shocked, to reflect more and to become aware of aspects that were relevant to them personally. This cluster was characterized by dark colours, containing artificial objects and showing destruction. With respect to Cluster 3, “the mediocre mythology”, participants showed neither particularly high or low emotional and cognitive reactions. It contained mostly colourful artwork, showing the earth as a whole and drawing on mythology. However, none of the pieces seemed to have something distinctive or outstanding in comparison to the others. The artworks in Cluster 4, deemed “the awesome solution”, made people react with the highest positive emotions and at the same time, high levels of sadness and disappointment. The artworks in this cluster also triggered the strongest cognitive reaction for nearly all cognitive variables and were characterized by showing solutions, as well as sublime nature, while making cause and effect of behaviour visible.

To summarise, in Study 1 all 36 pieces of art were assigned to four different groups, based on the emotional reaction participants showed to the art. It was possible to thereby identify a pattern of cognitive reactions and relate it to features that the art in each cluster had in common. Four clusters could be identified and characterized this way.

Study 2. Using the same data set as Study 1, Study 2 investigated the psychological process by which the perception of environmental art leads to emotions and cognitions and, subsequently, support for climate policies. Results of a person-level structural equation model showed (see Figure 2 for a schematic representation of the model; the whole model including coefficients can be found in Study 2) that negative as well as positive emotions were positively associated with a higher perceived quality of the artwork, stronger identification with the artist and more reflections on the artwork (e.g., the perceived relevance for

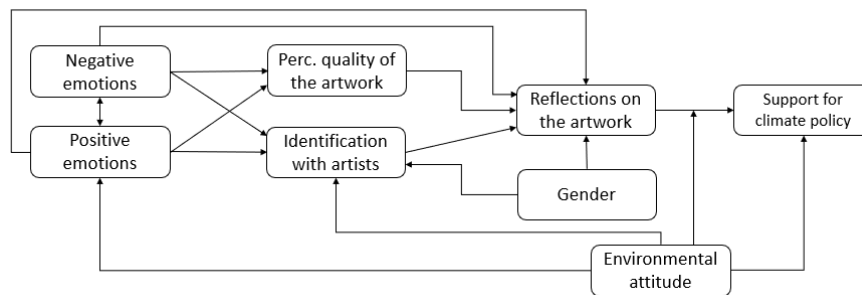


Figure 2 Schematic representation of the person-level structural equation model tested in Study 2

daily life, the level to which the artwork challenged social norms). Higher perceived quality of the artwork and stronger identification with the artist were also positively related with more reflections on the artwork. In turn, reflections on the artwork were positively associated with support for climate policies.

Socio-demographics and environmental attitudes were used as control variables. People who self-identified as women were found to identify stronger with the artist and to report more reflections on the artwork. Moreover, the favourability of environmental attitudes people reported were found to be positively associated with positive emotional reactions to the artwork, identification with the artist and support for

climate policies. Interestingly, environmental attitudes also moderated the relationship between reflections on the artwork and policy support. Whereas people with stronger environmental attitudes were already more positive to climate policies in the first place, they reflected less on the artwork, while people with weaker environmental attitudes reflected more on the artwork, and their support for climate policy increased more. In other words, people who did not support climate policy to such a strong degree before encountering the artwork because of low environmental attitudes, were stimulated to a larger degree to support climate policies if they reflected on the artwork. From the person-level analysis, we can conclude that environmental art, as found at the ArtCOP21, affected its audience mostly via the emotional reaction triggered, which then activated cognitions in the form of reflections that led to support for climate policies.

In the next step, the artwork-level was added to the model. This second level consisted of the characteristics of the artwork and allowed us to examine whether different characteristics were related systematically to psychological reaction patterns in the group of spectators. Results showed that positive emotions were positively correlated with artworks that showed “something personal” and when information was provided with the piece of art. They were negatively correlated if the piece of art was not colourful, employed the peak shift effect¹, was of monumental size, showed “something recognizable” such as a landmark or monument, or “depicted destruction”. Negative emotions were more strongly associated with pieces that employed perceptual problem solving and were polarizing and monumental in size. The perceived quality of the artwork was higher when the piece of art was a sculpture, while the level of identification with the artist was stronger when the art showed “something personal”, and weaker when it made use of the peak shift principle¹. Finally, the reflections on the artwork were stronger when the artwork challenged social norms and again, “showed something personal”. Therefore, we concluded from the level two analysis that there were certain characteristics of art, which either increased or decreased the psychological reaction to the piece of art and thereby facilitated or inhibited engagement with the artwork and its topic on the visitor level.

Study 3. Study 3 was actually conducted shortly after the first data collection around the PPs (Study 4). However, it is presented in this order here, because Study 4 and the assessment of the PPs signified the culmination of the Climart project and this dissertation, while Study 3 was a follow up on unanticipated findings from Studies 1 and 2.

The goal of Study 3 was to investigate the effect of contextualizing information on the perception of the environmental artwork. Previous research on the effect of information accompanying the artwork, found that giving short descriptions or titles to individual pieces of art increased the perceived meaningfulness of the artwork (Cupchik, Shereck, & Spiegel, 1994; Russell & Milne, 1997; Russell, 2003), as well as the understanding of it (Leder, Carbon, & Ripsas, 2006; Millis, 2001; Swami, 2013). An unanticipated finding

¹ The peak shift effect was found in animal discrimination learning and describes the ability to discriminate an object from another, not by recognizing a prototype but a rule and even more, if the rule is exaggerated, the effect is greater than with the original object. This effect also applies for humans and in the context of art (Ramachandran & Hirstein, 1999).

from Studies 1 and 2 was that the context in which the artwork was presented influences the perception of the artwork, as in the form of where the artwork was exhibited, or whether it was presented with information or without. To follow up and further study the role of context on perceptions of art, 123 participants were exposed to one environmental artwork ("Landscapes of Change" by Jill Pelto) and randomly assigned to either have or not have contextualizing information in the form of a text about the topic of the artwork and the artist. Dependent measures were the emotional (e.g., guilt, anger, sadness) and cognitive (e.g., reflections on the artwork, meaning-making, appraisal) reactions to the artwork, as well as pro-environmental intentions and behaviour.

Due to challenges in determining these partly subconscious psychological processes with self-reported measures, we decided to collect eye-tracking data -- meaning the participant's eye-movement across the art. Gaze patterns are frequently used in laboratory studies on art perception (Duchowski, 2017), with 'viewing time' and 'number of fixations' standing for the level of visual attention paid to a cue (Brieber, Nadal, Leder, & Rosenberg, 2014; Duchowski, 2017; Quiroga & Pedreira, 2011) and 'mean fixation durations' designating higher cognitive functioning (Duchowski, 2017). The assumption was that, dependent on the condition, visual processing of the artwork would lead to different levels of processing. More details on the eye-tracking methodology can be found below under section 3.2.4.

Pairing information with the artwork resulted in the artwork being perceived as more meaningful, interesting, likeable and with stronger emotions. Moreover, the relationship between the information condition and subsequent emotions were mediated by meaning. This indicates that, the more we understand an artwork, the stronger our emotional reactions are, which is in alignment with findings by Bubić et al. (2017) and Millis (2001). Information did not influence environmental intentions and behaviour in the present study.

Study 4. In the last stage of the Climart project, Michael Pinsky was commissioned to create a piece of environmental art, taking inspiration from the discussion with the environmental psychologists on the Climart team. The result was the immersive art installation "Pollution Pods". Study 4 reported on the effect of this artwork on its N = 2662 visitors in the first two locations where it was exhibited, namely Trondheim, Norway and London, United Kingdom. Again, similar emotional and cognitive reactions to the artwork were included. Moreover, pro-environmental intentions and behaviour were measured before and after experiencing the PPs.

Initial intentions to act were already strong in visitors before the PPs experience, and somewhat increased afterwards. The average increases in intentions to act were positively associated with the emotions "sadness, helplessness, and anger", "awareness of consequences" of peoples' actions, the "ascription of responsibility" of peoples' actions to themselves, and the realization of the "relevance of environmental problems for their daily life". The older and less educated participants were, the less likely they were to show changes in intentions. Even though intentions were strong, participants did not make use of the opportunity presented to them after the show in Trondheim to track their carbon emissions and related behaviour via an online application after visiting the PPs. This could either be interpreted that participants

did not feel inspired enough by the PPs to act, or the behaviour measure encountered methodological problems, which made it impossible to measure the behaviour people did show.

Another measure for the impact the PPs was the number of times the installation was exhibited: the number of people that visited it and the media attention it got. From this perspective, the PPs were a big success because they were exhibited, to date, at nine places all around the world, including New York, Melbourne and COP25 in Madrid, and there is the expectation that they will keep touring. More than 30,000 people² experienced the immersive installation, including the teen activist, Greta Thunberg, and several high-ranking policy makers. Additionally, more than 100 media outlets broadcasted TV clips and radio shows on the PPs, and numerous articles were written in newspapers and magazines³.

Conclusion. Environmental art such as the PPs, can create engagement with environmental topics like climate change. Psychologically, it can trigger positive and negative emotions and reflections, such as highlighting personal responsibility whilst making people aware of the consequences of climate change and how climate change can impact their daily life. Additionally, this dissertation identified characteristics of environmental art that were associated with the psychological reactions that motivate people to engage. Based on the emotional and cognitive reactions, as well as features of art, recommendations were derived for environmental artists and climate change campaigners, who want to increase the impact of their efforts.

The Climart project was an innovative transdisciplinary project, bringing together environmental psychologists and artists, to share their knowledge, experience and practice to fight climate change. The PPs and their world-wide tour are a great example of what such a collaboration can accomplish. There is much these disciplines can learn from and share with each other. This dissertation aimed to build a bridge between practitioners from climate science, the arts and climate change communication to maximize citizen engagement and put pressure on governments to unite against climate change.

² <https://capefarewell.com/pollution-pods/overview.html>

³ <http://www.michaelpinsky.com/reviews/>

1. Introduction

“It is said that revolution does not need art, but that art needs revolution.

That is not true. Revolution needs a revolutionary art.”

Diego Riviera, Mexican painter

Art is, according to the Mexican artist Diego Riviera, a very essential ingredient for achieving a fundamental change in society – namely a revolution. A revolution, or more neutrally formulated, a social transformation of societies, is what is needed to address one of the biggest challenges currently faced by humankind – climate change (Wurzel & Connelly, 2010, p.3). One could also say that climate change is an enormous cultural challenge for society (Buckland & Lertzmann, 2008), which raises several questions: Does a social transformation for a sustainable and carbon neutral future need art? Moreover, if art is a factor that drives changes in society, instead of being driven by it, how does it reach out, affect and engage citizens? And, does it need to be as Riviera proposes, “revolutionary art”, or, put differently, what signifies an effective and influential artwork from a psychological point of view?

This PhD-thesis offers a psychological assessment of the effectiveness of environmental art to raising awareness to address climate change - arguably a necessary component of a social transformation. It will investigate whether art can communicate environmental problems, such as climate change, in such a way as to engage spectators, and thereby add to efforts made through information and education campaigns for citizens. Furthermore, it aims to shed light on what psychological mechanisms make or do not make art a successful tool in the fight for climate mitigation and environmental protection. Described first, the umbrella under which the studies were conducted that set together this thesis, is the transdisciplinary Climart project, which set the goal to discover whether visual art can change viewers’ perceptions of climate change.

1.1 The Climart project – can visual art affect viewers’ perceptions of climate change?

The Climart project was a four-year transdisciplinary project, which brought together environmental psychologists, natural scientists and artists to discuss and assess whether “visual environmental art can affect viewers’ perceptions of climate change” (see www.climart.info). The structure and phases of the project will be outlined below.

1.1.1 Climart – a transdisciplinary approach

It is difficult to communicate the facts of climate change (Moser, 2010; 2016) and especially to connect it with decision-making and behaviour (Kollmuss & Agyeman, 2002). This is because climate change, unlike weather, is not directly

perceivable. Climate is an aggregate in time and many of its impacts are not immediately evident. The perception of its risk was even found to increase with spatial distance, meaning that people further away are perceived to be at higher risk (Gifford et al., 2009). These complex relations make climate change hard for most lay people to comprehend (Moser, 2010). However, communication of the causes and impacts of climate change has come far since the 1980's, when global warming first appeared on the political agenda (Moser, 2010; 2016). Moser gave an early comprehensive overview of the history of climate change communication and its pitfalls (Moser, 2010), as well as a look towards the future of climate change communication (Moser, 2016). Looking forward, Moser (2016) suggested that communicators need to find an approach that goes beyond informing and educating people, but one which tries to connect with them emotionally and culturally.

Following the idea of culturally connecting climate communication with citizens' lives, Hulme (2009, p.32) points out that the importance of *climate* is not just through its physical reality, but also through the cultural meaning and symbolism that is attached to it. Therefore, culture is as much needed to understand the reality of climate change as the natural sciences.

Additionally, more and more artists have dedicated their work to giving a form to the meaning of anthropogenic climate change in the last 20-30 years. Those artists used their art as a communication tool and have, according to Nurmis (2016), achieved more than what was possible through science reporting and political discourse.

Given all these facets - the climate science, the cultural and artistic understanding of climate change, and the question how to best reach out to citizens - the Climart project had to be transdisciplinary. Originally, the idea to involve art in raising engagement with climate change came from case studies conducted by Klöckner, who found an effect of art on its audience (2015, p.224-233). The main finding was that visual art installations on climate change created a more emotional and personally relevant understanding of the topic. This suggested that art might help to overcome the divide between scientific information and personal responsibility, especially for those who are not already worried and engaged in the topic. Based on the results from the case studies, Klöckner derived the following recommendations on how to create an effective environmental artwork (p.232):

1. Use a (visual) medium people are accustomed to. Many people prefer film to other media due to what they habitually consume.
2. Appeal to several senses; accompany vision by sound and other stimuli.
3. Create surprise and the opportunity to stop and reflect. Create an unexpected experience and a comfortable environment within which to engage with art.
4. Place the artwork outside the walls of the gallery. Try to approach people in their everyday life. This will extend the target group beyond the art-educated audience - a subset that is more likely to be engaged with the issue.
5. Connect to peoples' everyday lives by providing identification points, a familiar point of reference that people can relate to.

6. Create art pieces that work on an emotional level and provide an outlet by directing the audience to information about ways in which individuals can be part of the solution. Be aware not to create negative reactions by overplaying emotional drivers.
7. Carefully consider how to avoid denial of responsibility, which is one of the main threats to effective environmental communication through visual art.
8. Consider the use of humour and how it might enhance engagement with the target group, but balance this to avoid trivializing the subject.
9. Consider what kind of guidance (parts of) your audience might need to understand the artwork.
10. Consider and engage the audience when creating and testing the works. Piloting will give important insights into unexpected side effects.

These recommendations are directed towards the artists and creative practitioners who are interested in engaging their spectators with climate change. Klöckner concluded (2015, p.233) that, ideally, environmental art would create moments of reflection, awareness of a problem and individual emotional involvement. Given the connection to psychological states, he saw the potential for both artists and environmental psychologists/scientists to combine their expertise in order to understand artistic experiences and create art that engaged the public in taking action to address climate change. Thus, Klöckner and the artist Sam Jury⁴ initiated the Climart project to 1) bring together researchers with artists, 2) make the best use of knowledge in the different disciplines and 3) evaluate the effort artists have made to communicate their climate message to people. More information on the Climart project and its team can be found on the website of the project (www.climart.info/team).

As part of the project team, two PhD students were employed, which resulted in a PhD thesis by Roosen (2020) and this present thesis. Roosen's thesis incorporates a literature review on theories from environmental psychology that are related to climate art experience, developing and expanding Klöckner's findings noted above. Furthermore, Roosen's work is focused on the theoretical concept of new, alternative and utopian narratives, told by art. The methodological approach was qualitative, including interviews and focus groups. Roosen's main finding was that most people feel inspired by art, especially if it is an immersive art installation such as the Pollution Pods (the art installation that was commissioned by Climart, see below), but afterwards they often do not know what to do. Her conclusion therefore is that art should always be accompanied with more information, in the form of a documentary or a call to action against climate change, which can increase commitment to behaviour change (p.122).

1.1.2 This specific PhD thesis within the Climart project

The focus of the present work is to identify the psychological mechanisms by which environmental art affects its audience and connect these to pro-environmental actions. Asking questions such as, what psychological reaction do people show when they encounter environmental art? What is their emotional and what is their cognitive reaction and

⁴ <http://www.samjury.com/>

do these in turn relate to pro-environmental behaviour? Are variables that were identified by environmental psychological theory to motivate environmental behaviour also relevant in the setting of environmental art perception? Alternatively, is the effect of environmental art on its spectators not as strong as generally assumed and wished for by artists? Should art therefore stay 'free' and not 'sell itself' to the deed of communicating anything, including the urgency of climate change?

To answer those questions, a theoretical approach is chosen, combining theories from environmental psychology and art perception. Environmental psychology has identified psychological barriers and facilitators to environmental behaviour (Steg, van den Berg & de Groot, 2018). Simultaneously, art perception, also called empirical aesthetics, has investigated and suggested models for how people perceive art (Leder & Nadal, 2014). By combining theories from both fields, new knowledge can be generated on the mechanism of *environmental art perception*. Both fields have in common, that they consider emotions and cognitions to be important motivators of behaviour.

The methodological approach of this dissertation is quantitative, including data collected from questionnaire studies, eye-tracking, and statistical analyses of this data. The Climart project was split up into different phases, which will be introduced below. The phases were based upon the timing of exhibitions organized by Cape Farewell and coordinated data collection and collaborations within the Climart team.

Phase 1. The first phase included a literature review (Roosen, Klöckner & Swim, 2017) and a pilot study at a design exhibition and climate festival in Oslo. The pilot study involved testing some environmental psychological measures in the context of a public creative event that involved performance art. This study was neither published nor included in this dissertation because design and performance art, as shown on the festival, did not fit the narrower definition of environmental art chosen for this dissertation.

In their literature review, Roosen, et al. (2017) identified *inspiration through art* as a potential trigger for long-term changes in individuals, giving people the necessary motivation to change their behaviour. Furthermore, art uses innovative metaphors, comparisons and narratives, which regular climate communication generally does not. Art also visualizes the problem and thereby provides people with a personal experience and outlook of what climate change will be like, reducing the psychological distance to global warming. Lastly, taken from a social psychology point of view, especially participatory art was described to contribute to building a group identity. This is relevant for fighting a feeling of hopelessness and giving people a sense of being supported in their efforts to mitigate climate change (Roosen et al., 2017).

Phase 2. In the second phase of Climart, data was collected at an art and climate festival in Paris, ArtCOP21⁵. This festival was co-organized by Cape Farewell, a partner of the Climart project. The ArtCOP21 took place parallel to the Climate Change Negotiations by the United Nations Environmental Program in 2015. Questionnaire data from 874 respondents on 37 different visual pieces of art were collected; a detailed description of the method of data collection is given under section 3.1.2. Two different theoretical approaches were taken to the data set, resulting in one publication in the *Journal of Aesthetics, Creativity and the Arts* (Paper 1 – Sommer & Klöckner, 2019) and a second paper, which is soon to be

⁵ <http://www.artcop21.com/>

submitted (Paper 2 – Klöckner, Sommer & Swim). Study 1 examined the data with focus on the artwork, identifying pieces that were associated with similar emotional reactions in the spectators and then relating these to cognitive reactions and features of the art. Study 2 aimed to identify the psychological mechanism of art perception, by suggesting and testing a model of the environmental art perception process.

Phase 3. In Phase 3, a visiting researcher (Anna Keller) joined the project, and conducted a laboratory study within the theoretical framework of the present dissertation. This study, supervised by me, Klöckner, and Hanss, was published in the *Journal of Aesthetics, Creativity and the Arts* (Paper 3 - Keller, Sommer, Klöckner & Hanss, 2018). The aim of it was to investigate the effect of information provided by the piece of art, on the aesthetic experience and on pro-environmental intentions and behaviour. Contrasting to the field study in Paris, which analysed response to a range of artwork, this study was conducted on one specific piece of art. Additionally, to provide insight into the depth of visual processing of the art and produce information independent of self-reported data, eye-tracking methodology was used.

Phase 4. Phase four of the Climart project involved a commissioned artist. When the Climart commission was advertised, the Climart team received 139 applications from all over the world. In the summer of 2016, the London-based artist Michael Pinsky was awarded the commission and he immediately started working with the team. The environmental psychologists presented the literature review as well as the findings from the ArtCOP21 studies to Pinsky. Additionally, Pinsky was introduced to the Norwegian surroundings and people, because the artwork was supposed to be exhibited in Trondheim and take local settings and understanding of the Norwegian audience into consideration.

The aim of the Climart art project was not to illustrate climate science and its findings, but to stimulate an in-depth dialogue between natural science, psychology, and contemporary art - Pinsky's approach seemed most fitting to the project. The result of this collaboration is the immersive art installation 'Pollution Pods' -- five geodesic domes, each dome representing a city with its corresponding levels of air pollution. Through this installation, visitors could experience, with their whole body, what it feels like to breathe air from Trondheim as in comparison to London, New Delhi, Beijing and São Paulo. The Pollution Pods will be described in more detail in section 3.3.1. Questionnaire data was collected around the artwork in two locations: Trondheim and London. The analysis of this data and its results are the basis for the last paper within this dissertation, which was published in the journal "Global Environmental Change" (Paper 4 – Sommer, Swim, Keller, & Klöckner, 2019).

In the following section, environmental art and its history will be described, and a definition of environmental art will be given as basis for all other theoretical elaborations. Moreover, a selection of environmental artists and exemplary artworks will be introduced to give an insight into the diversity of environmental artworks that exist already and to set a frame for the artworks on which data was collected here. Since the aesthetic experience of art remains subjective, I decided to base the selection of environmental artists on 1) what art historians and media call the most influential modern environmental artists and 2) my personal taste, i.e. the artworks and artists that spoke most to me personally.

1.2 Environmental art and influential artists

A person that works with their hands is a worker.

A person that works with their hands and their mind is a technician.

A person that works with their hands, their mind and their love is an artist.

Greek saying

Every academic analysis about art has to face the question: “What is art and what is not art?”. This question is still debated in contemporary philosophy (see for example Adajian, 2007; Bahr, Carrara & Jansen, 2019) and would go beyond the scope of this dissertation. For the purpose of the present research, I have decided to define environmental art, within the confines of the type of art under investigation here. Also, I will describe the history of environmental art, to set a frame and give a historical context for the artwork used in the empirical studies.

1.2.1 Definition of environmental art

Environmental art in its many forms has been named land art (Wolfe & Russell, 2010), earthworks (Boettger, 2002, p. 9), ecological art (Wallen, 2012), eco-art (Martin, 2015), rebel creativity or visual activism (Demos, 2016a). The concepts behind these names are very similar to each other, although they vary in the degree of political involvement conveyed through the artwork. Climate change art, as described by Nurmis (2016) as a subgenre of environmental art, gained significance in the early 2000’s.

In the Climart project description, the focus is primarily on ‘climate change art’. However, given the history and examples of environmental art described below and, for this dissertation, I argue that focusing only on “climate change art” is too narrow. Whether a piece of art is focused on ‘environmental’ or ‘climate change’ themes depends on interpretation by the spectator. Take for example Agnes Denes’ ‘Wheatfield’ from 1982 – the artist described the concept and message behind it as follows:

“Planting and harvesting a field of wheat on land worth \$4.5 billion created a powerful paradox. Wheatfield was a symbol, a universal concept; it represented food, energy, commerce, world trade, and economics. It referred to mismanagement, waste, world hunger and ecological concerns. It called attention to our misplaced priorities.”⁶

If the piece of art was exhibited now, or we would ask Agnes Denes to interpret her work in the light of current environmental challenges, the topic of climate change and its impact on food production would surely be part of it. Furthermore, the Pollution Pods - the major project designed and implemented for the Climart project - focuses on air pollution and not climate change (the implications of these two topics represented in the PPs for this dissertation are discussed under section 5.5.4.) and is, therefore, strictly speaking not climate change art, but rather environmental art. Therefore, I reason that many environmental challenges today are in some way or another connected to climate change and, for this dissertation, the term ‘environmental art’ will include, but not be limited to ‘climate change art’.

⁶ <http://agnesdenesstudio.com/works7.html>

A useful definition of environmental art, that Marks, Chandler & Baldwin (2017) applied in their studies on the effect of environmental art on its audience, will also be used in the present dissertation:

“Environmental art is a diverse field of creative practice that includes works that aim to engender an appreciation of nature, as well as works that ‘employ nature as a medium’. It primarily involves art created with the intention of drawing attention to nature and raising awareness of environmental issues. Environmental art can be permanent or ephemeral and created in any format such as sculpture, photography, multimedia or performance.”

1.2.2 History of environmental art

Environmental art, according to Martin (2015), can be traced back to eighteenth-century Romanticism and the beginning of industrialisation. The environmental destruction and pollution caused by this era triggered a cultural counter-reaction – a romantic focus on nature, so to speak. However, when looking into the more recent history of environmental art, it becomes evident that not all environmental artists were driven by the idea of making the world a better and more natural place or raising awareness for environmental problems.

In the 1960's and 70's, artists took a less romantic stance and, instead, explored questions of environmental degradation through land use practices and geopolitical power relations affecting nature. Popular representatives of environmental artists of this period were Helen and Newton Harrison, Robert Smithson, Joseph Beuys and Agnes Denes (Wallen, 2012), to name a few. There was, however, a divide between these artists and other artists of their time. Some of them created artworks that were coined as ‘art-like art’ and some as ‘life-like art’ (Wallen, 2012). These two types of art ranged from what appears to be low to a high pro-environmental agenda.

Art-like art included self-referential works, meaning that these pieces of art were created simply for the sake of creating art and not to follow a political agenda. Demos (2016a) calls this kind of art ‘duty-free art’ and has described it as art that wants to remain free of purpose and political service, so as not to be indebted to anyone and only serve itself. One example of an environmental ‘art-like artwork’ is ‘Spiral Jetty’ by Robert Smithson. To make ‘Spiral Jetty’, Smithson used natural materials and placed them in a remote landscape. However, he also created a huge, invasive installation that could not be bought or transferred anywhere. His intention was a rebellion against the commercialized artworld, which sold paintings, to be packed and shipped off to their new owners (Boettger, 2002, p. 24), which was clearly not possible with ‘Spiral Jetty’. Smithson did not want to raise awareness for any threat to the ecosystem or living beings in which he placed his work; if anything, he most likely killed animals in the process of bulldozing his work into shape. Further examples of such invasive artwork are ‘Double Negative’ by Michael Heizer⁷ (1977) and ‘Lightning Field’ by DeMaria⁸ (1977). Therefore, it is not surprising that art-like artwork has often been criticized for insensitivity to its surroundings (Wolfe & Russell, 2010).

On the other side of the spectrum, artists who created life-like art emphasized connectedness between humans and ecosystems. They regarded themselves as public scholars and engaged citizens who were responding to the challenge and activist movements of their time (Wallen, 2012). Many of their sculptures and pieces were designed to correct an

⁷ <https://www.moca.org/visit/double-negative>

⁸ <https://www.diaart.org/visit/visit/walter-de-maria-the-lightning-field>

environmental wrong, such as 'Living Water Garden' by Betsy Damons⁹ (2010) or 'Prima Lingua' by Jackie Brockner¹⁰ (1996). Both pieces used natural ways of cleaning polluted water while giving extra meaning and several layers of interpretation through their shape and name of the artwork (Wallen, 2012). Apart from cleaning the water, these pieces represented the artist's intent to raise awareness for the value of water. Other examples of artists creating life-like art are Helen and Newton Harrison. Helen and Newton Harrison, also known as 'the Harrison's', will be described in more detail as one of the four selected environmental artists below.

Another way of understanding environmental art is from the perspective of public art, since many eco-art projects are not just simply placed in public spaces, but involve the interaction with the public audience and the site - as in Beuys' work which will be introduced below. Beuys was a German artist and activist, who coined the term 'social sculpture', which emphasized the potential of art to transform society (Körner & Bellin-Harder, 2009).

The last artist spotlighted in the three selected artists is Olafur Eliasson, who presented his first big exhibitions in the mid-1990's. Objectively speaking, what differentiates most recent creators of environmental art from those in the 1970's, is mostly the language used by the artists and the fact that artists in the present time do not have the geographical, rather romantic, focus on North-America. Many artists nowadays are seeing the world in a more geographically connected and global stance, than earlier artists (Demos, 2016b, p. 9-10). Environmental art in the past 20 years and outstanding artists from this period shall be introduced in the following section.

1.2.3 Environmental art in the past 20 years

In the past 20 years, the sense of urgency around climate change has increased and with it, the pressure by society on artists to get involved and contribute towards finding a solution to modern day environmental problems (Demos, 2016b, p. 7). This might be because more and more environmental scientists and communicators are calling for a 'cultural' and artistic response to climate change (Moser, 2016) and see that artists have a responsibility to deliver it. Alternatively, it might be due to a long tradition of seeing artists as 'catalysts of change' and the ones being at the forefront of societal shifts (Belfiore & Bennett, 2007). Opposingly, pressure is applied from the artworld itself to not contribute, with activist art being deemed 'not real art'. Artists are criticized for 'selling out their creativity' and making art that is not art purely for the sake of being art (Demos, 2016a; Nurmis, 2016; Wallen, 2012).

The challenge that environmental artists face today is how to dance on the tightrope that is stretched between political indifference and the accusations of instrumentalizing the creativity of the arts for any political outcome. Therefore, every contemporary environmental artist must place themselves on the artistic vs. activist spectrum and have their work judged on it (Nurmis, 2016). I would argue that categorizing artists as 'environmental' or 'activist artists' is not necessary, but it is certainly helpful to bare this spectrum in mind when evaluating the impact of 'environmental' vs. 'activist art'.

Looking more closely at artists and their works along the spectrum of activism, we find a dominance on the activist side - the 'rebel artists', who are trying to think beyond the accusations of destructive capitalism. They question the institutions in which art is exhibited and hosted, as well as their funding bodies (Demos, 2016b, p.10). One example is

⁹ <https://www.keepersofthewaters.org/betsy-damon/>

¹⁰ <http://jackiebrookner.com/project/>

the collective of visual activists from the group Labofii, based in France, who have dedicated their creativity to the fight for environmental sustainability and economic equality. Labofii refused an invitation to the Donaufestival in Krems, Austria in 2015, because they found numerous fossil fuel companies among the funders (Demos, 2016a). Another example is the group Liberate Tate, that came into existence to draw attention to hidden funding of the public arts institution 'Tate' in London, from the private oil corporation BP. With their performance 'Hidden Figures' the group wanted to raise awareness for these contradictory interests and put pressure on BP to liberate Tate, and the artsworld in general, from its unecological and unsocial influence (Liberate Tate, 2015). Not a group, but a solo artist who should be included in the group of rebel artists questioning the arts world and its connection to capitalism, is Ellie Harrison. Educated in the British art system, she endorses that this system prioritises the 'popularity' and 'image' of an artist more than creativity itself (Mission Models Money & Common Cause, 2013). Consequently, her approach to her art is to "reimagine my role in the world, both as 'artist' and as human being" (p.19) and to let the flow, play and curiosity that came from engaging with her own creativity, improve her quality of life.

Looking at the spectrum from the environmental artistic side, Michael Pinsky and Cape Farewell are two examples of solo artists and artist collectives who are more likely to hide their political message thus leaving it to the spectator to read between the lines. In her comprehensive analysis on the practice and discourse of climate change art, Nurmis (2016) describes the art collective Cape Farewell as a group able to invoke emotion and impart knowledge relating to climate change through their work without explicitly letting the art itself be instrumentalized. Since Cape Farewell is part of the Climart project, their work will appear several times throughout this dissertation, as will the creative practice of Michael Pinsky - the commissioned artist for the project. So as not to limit this evaluation to the artists involved in the Climart project, three other relevant and interesting artists will be presented in the following section.

The Harrison's. Helen and Newton Harrison have produced work on climate change since the mid 1970s. They are some of the pioneers in the eco-art movement and remain big figures in the environmental art scene. With almost forty years of experience in the field, the last big official project listed on their website is from 2014.¹¹

The creative practice of the Harrison's is very site specific, since for them, "the real client is the land itself, and creativity is understood as a shared flow, meshing individual and collective processes" (Kagan, 2014, p.2103). Therefore, everywhere they worked, they initiated a dialogue and collaborations between artists, scientists, and local citizens to discover solutions, which maintain biodiversity and facilitate community development (Harrison & Harrison, 1993). Their goal is to start a process that ultimately develops a life of its own. The fact that the Harrison's enter a project as artists gives them the possibility to ask probing questions and to offer alternatives in situations where interests are often entrenched and dominated by economic and political agendas (Wallen, 2012). Overcoming such entrenchments is hoped to motivate all stakeholders involved. However, not everything comes easily for the Harrison's either – they encountered difficulties from curators, art institutions and the media. For example, they were not allowed to display all of their pieces during the implementation of their 'Survival Pieces' in 1970-1972.¹² – which were inspired by the thought that

¹¹ <http://theharrisonstudio.net/curriculum-vitae-1970-2014>

¹² <http://theharrisonstudio.net/the-survival-pieces-1970-72>

"[...] if we were going to survive as a species, we are going to have to learn, how to grow our own food and take care of ourselves, at one point or another. So, we started looking at what that means. How do we maintain and support our top soil? For instance, it takes almost a 1000 years to grow one inch of top soil. How precious is that? That was the meaning it had for us in the 70's."

Helen Harrison¹³

Their first Survival Piece 'Hog Pasture'¹⁴, let a hog live on pasture or meadow in the museum and forage for food for the time of the exhibition. Afterwards, the installation was intended to be given to a school, so that the pupils could learn about animals. The museum, however, did not allow a pig on their premises. Therefore, 'Hog Pasture' did not take place until its re-enactment in 2012 at the Museum of Contemporary Art (MOCA), Los Angeles. The Survival Pieces critically examine the sustainability of food production and our actions connected with it. In the end, food is our closest connection to the environment and with our consumption choices, we all participate in agriculture practices (Ryan, 2015). This is as true now as it was in the 1970's; maybe one can say that its relevance has increased with the increase of big scale meat production in the last centuries (Ilea, 2009).

Joseph Beuys. The German artist Joseph Beuys was not just an artist, but also a radical ecologist and pioneer in investigating the role art can play in creating new paradigms for the relationship between humans and the environment (Adams, 1992). Much has been written about Beuys, his concepts, performances and installation, as well as his political engagement as one of the founders of the Green Party in Germany. In the present dissertation, I would like to highlight his concept of the 'Social Sculpture' and one of his biggest and most influential installations '7000 Oaks', which has changed the cityscape of the city of Kassel, Germany.

The idea of the 'Social Sculpture' was born from Beuys's understandings of art and his idea of ecological and social problems and possible solutions to them (Adams, 1992). For Beuys, anything that could be moulded to convey a message or information was 'material'. Therefore, he believed that art should not orient itself on objects, but on conveying meaning and information (Beuys, 2007, p.56). Materials in Beuys understanding included 'speech' as much as 'fat', one of his favourite materials, because of its reaction to warmth and ease to shape (Adams, 1992). The 'Social Sculpture' was, in Beuys view, an 'ecological Gesamtkunstwerk' (= ecological overall artwork), something like the final and always ongoing sculpture. It was supposed to be created by everyone through democratic participation and by reshaping society as a social organism and work of art. In addition, for Beuys, art was synonymous with creativity, in a sense of creativity being the force that 'creates' (Adams, 1992).

The installation '7000 Eichen' ('7000 oaks') is an exemplary piece from 'Social Sculpture'. It was commissioned by the Documenta 7 in 1982, in Kassel, Germany. Beuys prepared 7000 tree settlings, most of them oaks, and 7000 basalt stones and put them in an hourglass shape on the Friedrichsplatz, in front of the Documenta building. His idea was that the citizens of Kassel would come and take a tree with them, together with a basalt stone and plant it wherever they wanted in the city. This process, however, was impeded by several factors: 1) The city council had to approve the location of each tree before it was planted, and 2) people had to want to plant a tree and thereby contribute to the reforestation of their city. Beuys had to install an office on the Friedrichsplatz, where two of his assistants had to mediate

¹³ <https://www.youtube.com/watch?v=BgsFnRzGrJY#action=share> , 2.18 min in the video.

¹⁴ <http://theharrisonstudio.net/hog-pasture-survival-piece-1-1970-71>

between the city council requirements and the citizens. The installation was accompanied by concerns about possible damage to the utility lines under sidewalks, and discussions about whether trees even belong in a city. After the Second World War, Kassel was a city, very much designed for and dominated by cars, which was another reason why Beuys wanted to reforest this city - to connect the citizens again with nature (Körner & Bellin-Harder, 2007).

With this work, Beuys intended to create an artwork that was going to last 300 years (the average age of an oak tree, if well cared for). The fact that his trees will not last 300 years (some of them have already had to be replaced, because they were planted on poor soil or close to streets, which is not a spot conducive for the successful planting of a slowly growing oak tree), and that he met a lot of opposition along the way, is all part of the 'Social Sculpture'. Many difficulties had to be overcome by communicating with people and attempting to change their mindsets (Körner & Bellin-Harder, 2007). Nowadays, the installation is an integral structure of Kassel and has been made a monument.

Olafur Eliasson. When it comes to contemporary climate change art, one has to mention the Icelandic-Danish artist Olafur Eliasson. Eliasson is mostly famous for his installations playing with light and reflections as demonstrated by his artificial 'Waterfall' in Versailles¹⁵ and his 'The Weather Project'¹⁶ at Tate Modern in 2003. The 'Weather Project', according to Eliasson, told a story about climate and its social effects in the setting of an urban museum space. Especially in the heart of London, the weather represents nature and the environment. While we humans can control the climate inside of our buildings, we remain helpless regarding the climate outside and cannot even fully accurately predict it. Eliasson suggested that the installation brought up thoughts on this human conundrum and allowed visitors to reflect on it.

Moreover, Eliasson is known for his firm beliefs that art has the power to change the world (Nurmis, 2016). In his blog from 2016, he writes that art can make a difference, since it does not show people what to do, but instead connects to the senses, the body and the mind. In Eliasson's opinion, art can make spectators feel the world, and thereby inspire thinking, awareness and action.¹⁷

Eliasson's most closely related artwork to climate change is undoubtedly 'Ice Watch', on which he collaborated with Minik Rosing. It was exhibited three times: in 2014 in Copenhagen on the square in front of the City Hall to mark the publication of the IPCCs Fifth Assessment Report, in 2015 on the Place du Pantheon in Paris and in 2018 in front of the Tate Modern, the latter two in parallel with the UN Climate Change Negotiations.¹⁸ Since 'Ice Watch' was also part of the ArtCOP21 in Paris, we were able to collect data on this installation. 'Ice Watch' is part of the cluster called "the challenging dystopia", that was associated with strong negative emotions and environmentally relevant thoughts (see sections 4.1.1 and 5.2).

For the temporary sculpture 'Ice Watch', several ice-blocks were fished out of the Nuup Kangerlua fjord in Greenland, where they had become detached from the big ice sheet due to global warming. The increased melting of arctic ice is contributing to rising sea levels. Each ice block weighed between 1.5 and 5 tonnes at the beginning of the installation. Eliasson and Rosing hoped that by experiencing the melting of these ancient pieces of ice, hearing it crackle, seeing it

¹⁵ <https://olafureliasson.net/archive/artwork/WEK110140/waterfall#slideshow>

¹⁶ <https://www.tate.org.uk/context-comment/articles/the-weather-project>

¹⁷ <https://olafureliasson.net/archive/read/MDA117961/why-art-has-the-power-to-change-the-world#slideshow>

¹⁸ <https://olafureliasson.net/archive/artwork/WEK109190/ice-watch#slideshow>

change its colour, many people would understand the reality of global warming. Several thousand people took the chance in all three prominent locations, to come and see 'Ice Watch' and to physically experience the melting ice caps in the North. To counteract criticism connected with the environmental footprint of such an installation, the artists had the energy cost and thereby the carbon emissions related to the installation estimated by an independent NGO. It was assessed that the energy cost for bringing "one of these blocks to London is equal to one person flying from London to the Arctic and back to witness the ice melting".¹⁹

1.3 Art Perception and mechanisms of environmental art perception

Moving on from examples of environmental art, this chapter will outline the psychological processes underlying the perception of art in general. There are several experimental research fields with a psychological focus on art and aesthetics (Joshi et al., 2011) called empirical aesthetics, psychology of art, and art perception. These fields aim to describe the psychological mechanisms involved in the appreciation of art (Joshi et al., 2011), which includes identifying the structural components of art, interpreting the symbols used by the artist (Arnheim, 1986, p. 4; Joshi et al., 2011) and linking the work to its historic context (Leder & Nadal, 2014). By combining insights into the mechanism of art perception with findings from environmental psychology on what characterizes successful environmental communication, I hope to gain an understanding of the mechanisms involved in environmental art perception.

1.3.1 Models of art perception

In their theoretical paper from 2016, Pelowski and colleagues give an overview on the different theoretical models that have dominated art perception in the last 20 years. The paper also emphasizes the importance of art for society and offers plenty of theoretical connections to environmental psychological processes, mostly via *emotional reactions* to art and the *meaning-making and reflection* that is described to be an outcome of the art perception process. To be more specific, most models of art perception indicate that art triggers cognitive processes, such as meaning-making and reflections, that possibly lead to new insights or even an epiphany. These reflections and new insights on the other hand can lead people to challenge their existing views (Pelowski et al., 2016), which is relevant in the context of climate change and social transformations.

In order to describe in more detail the connection I made between the theory of art perception and environmental psychology, it is helpful to explain the structure of most art perception models. They consist of three main components: 1) Inputs that feed into experience, including (apart from the art itself) the personality of the spectator, socio-demographics, the baseline emotional state and specifics about the artists and piece of art. 2) Automatic and neural mechanisms that react according to the input, and 3) outputs, including conscious emotions and cognitions that can even have behavioural implications (Pelowski et al., 2016). In the following section, it will be outlined in what respect the different stages play a role for this dissertation.

1.3.2 The role of inputs of art perception models for the present studies

Input factors are as described above, the piece of art itself, as well as everything that surrounds it, such as the setting (museum, gallery, outside space), auditory input and possibly contextualizing information that is given. Similarly, social

¹⁹ <https://www.tate.org.uk/whats-on/tate-modern/exhibition/olafur-eliasson-and-minik-rosing-ice-watch>

aspects, such as whether the viewer is seeing the piece alone or with others. Lastly, the final influencer of the art's effect on the viewer, is their individual characteristics which dominate their perception (Pelowski et al., 2016).

In the empirical studies of this dissertation, input factors were mostly socio-demographic variables (Study 1-4), characteristics of the artwork (such as colour, materials and style of the artwork), as well as the intention of the artist to communicate an environmental issue through their work.²⁰ Implications of input factors taken into consideration are described and discussed in the method section of the respective studies.

1.3.3 The processing mechanism of art perception and its role for the present dissertation

The processing mechanism, or second stage of many art perception models described by Pelowski and colleagues (2016), includes the automatic, early and intermediate visual processing of art. Just as with any other stimulus, art is processed in different parts of the brain and research identifying the location of the art perception processes is called neuropsychology of art and neuroaesthetics (Chatterjee, Widick, Sternschein, Smith & Bromberger, 2010; Capó, Cela-Conde, Munar, Rossello, & Nadal, 2008). To go into detail on the neural and biological basis of art perception would be beyond the scope of this psychological dissertation. It is however important to note, that cognitive neuroscience and its tools help psychologists understand the relation between cognitive processes and their underlying neural mechanisms. Additionally, neuroscience helps psychologists study emotions and cognitions that are not directly followed by behaviour (Pearce et al., 2016).

In the context of art perception, neuroscience found that basic components of the artwork, such as colour, location, luminance, shape and motion, are being extracted in the early processing stage of art perception (Leder & Nadal, 2014). These components are then grouped or separated to form objects, faces or landscapes (Pearce et al., 2016), together with a first automatic assessment of beauty and attractiveness (Chatterjee, 2010). In the late vision processing stage, sections of the piece of art that are given special attention are being selected, whilst a connection between personal memories and experiences is made (Chatterjee, 2004; Tinio, 2013; Pelowski, et al., 2016). This personal connection is important for meaning-making in the output stage of art perception. Furthermore, intermediate processing is non-linear, meaning that the spectator can jump between steps and numerous processes can run in parallel (Nadal, Munar, Capó, Rossello, & Cela-Conde, 2008).

1.3.4 The output stage of art perception models and its role for the present dissertation

In light of the input-, processing- and output-stages of art perception (Pelowski et al., 2016) and to answer the overall research question of the Climart project: "Can visual art affect viewer perceptions of climate change", I decided the inputs that I would define as "environmental art perception process" were set by the environmental pieces of art that were part of Climart and the socio-demographics and characteristics the participants brought with them. Methodologically, I decided to control but not manipulate them in the experimental set up. Second, it would have been

²⁰ For the ArtCOP21 data collection (Study 1 and 2), I assumed that registering an artwork as part of ArtCOP21 festival, which all the artists or their curators in the study had done, presents a certain interest in climate change communication through the artist's work. In Study 3, the artist Jill Pelto clearly states on her website that it is her aim to raise awareness for environmental topics, while for the last artist whose work was studied for this dissertation (Study 4), Michael Pinsky, this intention was a selection criterion for the commission. Therefore, I would argue, that the interest of the artists to raise awareness for climate change and inspire change in their viewers was given for all artists, but not operationalized as measurable variable.

very interesting to investigate whether differences in basic components of the environmental art could affect people in the initial processing stage of environmental art perception. Looking at the way environmental art is being processed in the brain could have been the topic of a neuroscience dissertation, not one in psychology such as this dissertation. The output stage of art perception on the other hand, allowed me to define variables assumed to be the result of the environmental art perception process, while at the same time possible antecedents of pro-environmental behaviour.

The output variables that dominate the output stages of all art perception models are: Emotions, appraisal and meaning-making (Pelowski et al., 2016). Emotional reactions to art are sophisticated, differentiated, affective reactions (Silvia, 2005a; 2005b), while appraisal can be understood as a general evaluative judgement by the viewer (Zaidel, Nadal, Flexas & Munar, 2013), and meaning-making is part of the cognitive, information processing outputs of the art perception process (Pelowski et al, 2016). In the four studies comprising this dissertation, the appraisal function is included as measure called 'perceived quality of the artwork'.

In the following two sections, relevant research in the field of art perception regarding emotions and meaning-making is presented. This is followed by research from environmental psychology on the relevance of emotional reactions and cognitions for raising awareness of climate change and triggering environmental behaviour, as the last theoretical field of this dissertation.

Findings in art perception on emotions relevant for the perception of environmental art. In art perception, it is common to reduce emotional reactions to art to a dichotomous measure of 'liking or disliking' a piece of art (Silvia 2005a; 2007; 2009). Silvia (2005a) was the first to suggest the *appraisal theory of emotions* is relevant for understanding perceptions of art, arguing that incorporating modern theories from emotional psychology would further the field of art perception. The appraisal theory of emotions is especially suitable for the context of art perception, since it proposes that emotions originate from peoples' assessments of events (or pieces of art), and not the events themselves. Also, the emotion is based on how the events relate to goals, values and interests important to the individual (Ellsworth & Scherer, 2003; Moors, Ellsworth, Scherer & Frijda, 2013). This allows the theory to explain the subjectivity of emotional reactions to art (Silvia, 2007), including climate change and environmental art. Being subjected to a piece of art that depicts consequences of climate change, for example, can cause different emotional reactions in people, dependent on how strongly the viewer believes that it is their responsibility to reduce their carbon footprint or dependent on how much the viewer feels that climate change will affect them personally (see section 1.4.2).

The emotions included in the studies of this dissertation were selected based on what kind of emotions could be elicited through appraisal of a piece of art – a sense of awe, inspiration or surprise, but also guilt, anxiety or anger. The findings from environmental psychology, for which emotions are especially important for motivating or inhibiting pro-environmental engagement, will be presented in section 1.4.1.

Findings in art perception on cognitions relevant for the perception of environmental art. Meaning-making and cognitive processing is also referred to as 'cognitive mastering' in art perception. It is the process in which an understanding of art is created through associations to existing knowledge and interpretations of what is shown in the piece of art (Leder et al., 2004; Leder, 2013; Leder & Nadal, 2014). Cognitive mastering occurs with conscious awareness (Tinio, 2013) and is described as the stage in which viewers try to satisfy their need to understand the art. It is generally

accepted by researchers in the field that the search for meaning represents maybe the most important cognitive feature of the aesthetic experience (Bubić, Sušac, A. & Palmović, 2017; Zaidel, Nadal, Flexas & Munar, 2013).

The process of cognitive mastering or meaning-making can be supported by information given alongside the artwork. Eye-tracking studies have shown that different types of verbal information from art can influence the viewers' perception (Locher, Krupinski, & Schaefer, 2015; Bubić, Sušac & Palmović, 2017; Lin & Yao, 2018). In Study 3 of this dissertation, we investigated how information about climate change provided alongside the environmental artwork affects meaning-making, as well as other cognitive and affective variables.

In this dissertation, the process of "meaning-making" is assumed to incorporate reflections and contemplations on the artwork and its environmental topic. Another cognitive aspect I presumed to influence the perception of the piece of art is the perception of and level of identification with the artist. White, Kaufman and Riggs (2014) found that people typically stereotype an artist to be special, someone who "breaks the rules" or is even a "mad genius" (Kaufman, Bromley & Cole, 2006), which could be relevant in the context of a revolutionary change needed with respect to climate change (see beginning section 1. Introduction). Several studies cover the topic of how artists perceive the world and how their outlandishness affects their creativity (e.g. Perdreau & Cavanagh, 2013; Vogt & Magnussen, 2007). However, little is known about how people perceive artists and how much they identify with them. I assumed that a level of "strangeness" might be expected of the artist and help the story the artist wants to tell. On the other hand, it could be that if the artist is perceived to be too strange, the work becomes unrelatable with a reduced ability to identify with the artist. Therefore, measures on "identification with the artist" were included as cognitive aspects of environmental art perception (Study 1 and 2). However, the theoretical focus changed during this dissertation and in Study 3 and 4, other concepts from environmental psychology were investigated (see section 1.4.2).

To summarize, cognitive processes triggered by art were expected to impact the personal relation and intention to act on climate change. The cognitions relevant from the environmental psychological side contribute to meaning-making. It is important to note, that these cognitions are subjective and personal. This is because the art experience is not an objective process, in which the form and colour of a piece of art is being analysed, but the topic of the art is combined with personal memories, values and knowledge (Pearce et al., 2016). Secondly, it is inherent in the art experience, that the viewers want to make sense of the art and try to give it meaning (Pelowski et al., 2016). This process of meaning-making is, where I assume that the environmental message presented by the artist has the potential to reach the viewer. In a way, environmental art lets the spectator find their personal meaning of climate change by themselves. What cognitions comprise this process of meaning-making will be described later on, after a short introduction to the field of environmental psychology.

1.4 Environmental psychology

The field of environmental psychology is defined as "the discipline that studies the interplay between individuals and the built and natural environment". This means that environmental psychology examines the influence of the environment on human experiences, behaviour, and well-being, as well as the influence of individuals on the environment, that is factors influencing environmental behaviour and ways to encourage environmental behaviour" (Steg, van den Berg & de Groot, 2018, p.2). In other words, one part of environmental psychology conducts research on

positive and negative influences of environmental conditions on well-being and experiences. It aims to promote well-being through the environment, and conduct studies on environmental stressors, design, architecture, health effects of nature and so forth. The other part focusses on the impact of humans on the environment. It aims to elicit the psychological mechanisms underlying environmental behaviour and how to communicate best the necessity to act against climate change and other environmental issues. Environmental psychology has a variety of theories explaining pro-environmental behaviour, for instance the Theory of Planned Behaviour (Ajzen, 1991), the Norm Activation Theory (Schwartz, 1977; Schwartz & Howard, 1980), theories on values, emotions, habits, social dilemmas and social identities (Steg, van den Berg & de Groot, 2018, p. 10).

Environmental psychology also includes research on climate change communication, evaluating the effectiveness of different communication strategies. Successful communication was found to include cognitive, affective and behavioural aspects (Geiger, Swim, Fraser, & Flinner, 2017) and to have the potential to inspire individuals (Swim, Geiger, Sweetland, & Fraser, 2018). Many communication strategies are based on a deficit model, meaning that people have too little knowledge about climate change, and with more information and knowledge, awareness and engagement would increase. Communication strategies therefore often consist of educational campaigns delivering scientific information to citizens, attempting to fill the gap of knowledge surrounding climate change (Suldovsky, 2017). However, in their review article, Steg and Vlek (2009) describe that increased knowledge about the environment does not necessarily translate into more pro-environmental attitudes, beliefs and behaviour. For this reason, environmental communicators and funding bodies are asking for cultural approaches, involving the arts and humanities to come up with cultural solutions (Moser, 2016; European Commission Horizon 2020).

The above definition of environmental psychology places this dissertation right at the heart of both branches of environmental psychology and climate change communication. It investigates the effect of art, which is anthropogenic and a form of human made environment, on human experiences and how these experiences translate into factors communicating the need for environmental awareness to encourage pro-environmental behaviour. More specifically, the present dissertation draws on emotional theories and cognitive concepts used in environmental psychology to make a connection between the perception of environmental art and potentially triggered environmental intentions and behaviour.

1.4.1 Findings on emotions as influencing factors of pro-environmental behaviour

Emotions are essential for decision making and for motivating behaviour (Pfister & Böhm, 2008), as they generate preferences for choices (Zeelenberg & Pieters, 2006), including choices relevant in the context of climate change. Emotions were found to be associated with environmentally friendly behaviour (Klößner, 2011; Wang, Leviston, Hurlstone, Lawrence & Walker, 2018) and climate change policy support (Smith & Leiserowitz, 2014).

In 2003, Böhm suggested to categorize emotions as “consequence-based” emotions, which are basically reactions to the evaluation of consequences of climate change, both anticipated and actual. Consequence-based emotions include *fear*, *regret* or *sadness*. A second category is “ethic-based” emotions, like *anger*, *disappointment*, *shame*, or *guilt*, that are triggered by the violation or neglect of ethical principles. In a later theory, Pfister and Böhm (2008) describe different functions of emotions, of which in the context of environmental art and climate change, the “relevance function” and “commitment function” are especially relevant. The relevance function focusses attention on specific events or objects,

while the commitment function enables collaboration with others against the short-term self-interest of individuals, for the sake of a higher goal (Pfister & Böhm, 2008).

Table 1 Overview over which emotions were included in Study 1-4, based on findings from art perception and environmental psychology

Positive emotions									
	Happiness	Hope	Awe	Inspiration*	Surprise				
Study 1	(x)	(x)	(x)	(x)	(x)				
Study 2	(x)	(x)	(x)	(x)	(x)				
Study 3									
Study 4	(x)	(x)	(x)	(x)	(x)				
Negative emotions									
	Guilt	Apathy	Sadness**	Anger	Anxiety	Shame	Pride	Fear	Helplessness
Study 1	(x)	(x)	(x)	(x)	(x)				
Study 2	(x)	(x)	(x)	(x)	(x)				
Study 3	(x)		(x)	(x)		(x)	(x)	(x)	
Study 4	(x)		(x)	(x)	(x)	(x)	(x)		(x)

* In Study 1 and 2, the emotion "inspiration" was called "inspiration and enthusiasm", which resulted in methodological issues, as discussed in the text. It was therefore changed to "inspiration" only in Study 4

** The same is true for the emotion "sadness", which was formulated as "sadness and disappointment" in Study 1 and 2

In the case of environmental art, it can be assumed that the relevance function leads to an evaluation of environmental and personally relevant features of a piece of art, scanning the painting or sculpture for such aspects, whilst the commitment function makes people committed to their pro-environmental choices; even if it is not in their immediate interest. These assumptions are in alignment with a recent study by Wang et al. (2018) which suggested that climate change itself does not cause emotions, but that things we care about, such as our planet or future generations, do instead - that these "objects of care" mediate the emotional reactions to climate change. The climate change related emotions included by Wang et al. (2018) were *anger*, *fear*, *despair*, *guilt*, *shame*, *apathy*, as well as *hope* and *joy*.

Studies on negative emotions report mixed findings regarding the motivation and commitment the emotions create for environmental topics. *Guilt* is maybe the most researched emotion in the context of climate change. It is an ethic-based emotion of the commitment function and was found to guide decisions in social situations. Moreover, guilt explained intentions to act on climate change and actual mitigating behaviour (Mallett, Melchiori, & Strickroth, 2013; Ferguson & Branscombe, 2014; Swim & Bloodhart, 2015; Rees, Klug, & Bamberg, 2015). Studies on *fear* and *anxiety* induced by images of climate change found that these emotions had a two-sided effect; on the one hand, the images got peoples' attention and made climate change seem important to them, whilst on the other hand, the emotions triggered hindered engagement and distanced viewers, creating *apathy* (Nicholson-Cole, 2005; Wang et al., 2018) and feelings of being overwhelmed (O'Neill & Nicholson-Cole, 2009; Corner, Webster & Teriete, 2015). Other negative emotions such as *anger* were found to lead, in the context of in-groups, to intentions to punish the responsible people, while *pride* predicted favouring an in-group dedicated to environmental protection (Harth, Leach & Kessler, 2013). This implies that people need to feel proud and part of an environmental in-group in order to want to act on climate change and punish behaviour that does not comply to pro-environmental rules.

Studies on positive emotions with respect to climate change are rarer, even though people can have positive emotions about it. Consequence-based positive emotions occur for example, when a person assumes or experiences positive, or the absence of negative, consequences (Böhm & Pfister, 2017). For example, when an extreme weather event does not occur despite being predicted, people can feel relief, *happiness* and *hope*. A study by Smith and Leiserowitz (2014) pointed to a strong association between *hope* and climate change policy support, backing the notion that positive emotions can motivate pro-environmental behaviour. A positive emotion often mentioned in the context of nature, is the 'sublime', that can be associated with *awe* and *inspiration*. Many environmental artists try to give an impression of sublime nature in their works, thereby emphasizing how horrifying the impact of climate change can be, which can again create apathy (Nurmis, 2016).

To summarize, especially in recent years, an increasing number of studies have investigated the association between emotions and motivation to act on climate change. To add to these efforts, I included several negative as well as positive emotions in my dissertation, based on the emotion theories by Böhm and Pfister and the studies on climate change and emotions presented above (see Table 1). In Study 3, Keller as first author, suggested to focus solely on negative emotions but extend the emotions used in Studies 1 and 2 by two more negative emotions. In Study 4, a combination of emotions from Studies 1, 2 and 3 were selected. Table 1 also shows an improvement of the methodological implementation in this dissertation– in the first two studies based on the same data, two variables were included ('inspiration and enthusiasm', 'sadness and disappointment') each representing two distinct emotions. This is methodologically imprecise, since it is unclear, whether the respondent answered more to the 'inspiration' or the 'enthusiasm' aspect of the question. This was corrected in the following studies.

In all four studies, it was not tested whether the pieces of art caused these emotions; in order to do that, a measure of emotional state would have been needed prior to exposure, which was not feasible given the conditions of the data collections (see 3. Methods) However, presumably several emotions were triggered by the art and the emotional reactions were associated with changes in behavioural intentions and environmental behaviour.

1.4.2 Cognitive concepts from environmental psychology with potential to motivate pro-environmental behaviour in the context of art

Curtis and colleagues (Curtis, 2009; Curtis, 2010; Curtis, 2011; Curtis, Reid, & Reeve, 2014) conducted several studies on art festivals and exhibitions that investigated how art depicts environmental problems and influences public understanding. These studies are based on a social and community psychological approach and they found that attitudes, beliefs and values, as well as a change in the awareness of consequences, are underlying psychological variables affecting people through art (Marks, 2015; Curtis, Reid & Reeve, 2014). This dissertation builds on these findings, while at the same time moving the theoretical focus to art perception and emotion psychology as described above.

The process of meaning-making described as output of the art perception process (Pelowski et al, 2016) also occurs in theory and research in environmental psychology and art. Roosen, et al. (2017) describe that art creates a space in which the spectator can *reflect* on the topic of the artwork. In this state of *reflection and contemplation*, art is said to encourage people to ask themselves difficult questions - for example, about the value of life, the environment, or our relationship with each other (Marks, Chandler, & Baldwin, 2017; Chandler, Baldwin, & Marks, 2014). In an empirical

study by Jacobs, et al. (2013), the effect of an interactive environmental piece on its audience was investigated. The authors found that the spectators especially appreciated being given space to reflect, contemplate and to be able to come to their own conclusion. Given the number of theories about environmental art allowing reflections and meaning-making, and the small number of empirical studies, I decided to fill this research gap and to include in all four studies measures for *reflections around the piece of art, meaning-making and contemplation* (see Table 2).

Table 2 Cognitive environmental psychological concepts included in the four studies comprising the present dissertation.

Concept	Reflections on the artwork, meaning-making, contemplation	Relevance for daily life	Awareness of consequences of climate change	Ascription/ awareness of responsibility/ impact of own behaviour	Systems thinking (geographical, time and interpersonal connectedness)	Identification with the artist	Appraisal of the artwork (liking and interest)
Study 1	(x)	(x)	(x)	(x)		(x)	
Study 2	(x)	(x)	(x)	(x)		(x)	
Study 3	(x)						(x)
Study 4	(x)	(x)	(x)	(x)	(x)		

Chandler, et al. (2014) defined environmental engagement to consist of people’s personal connection with nature through emotional, cognitive and behavioural aspects. Moreover, they described that *personalising* the topic of climate change provoked an emotional reaction to the topic. On a cognitive level, this can happen through a realization of the *relevance for daily life* of the consequences of climate change. Raising peoples’ awareness of how climate conditions affect them daily is essential for creating engagement (O’Neill & Nicholson-Cole, 2009). Environmental art can enable spectators to contemplate the impact of the climate they live in on their daily lives, as well as the impact of their actions on their carbon emissions. In this dissertation, the studies including art with a connection to consequences of climate change in daily life, included a measure for *relevance for daily life*. This was not the case for Study 3, therefore no measure for relevance for daily life was included (see Table 2).

Other cognitive concepts connecting climate change to peoples’ personal lives are *awareness of the consequences* of their own actions and *ascription of responsibility* for the impact of actions on themselves (Bamberg & Schmidt, 2003; Stern, 2000; De Groot & Steg, 2009). Both concepts are based on the Norm Activation Model by Schwartz and Howard (1980) and have been extensively tested in connection with environmental behaviour (De Groot & Steg, 2009). *Awareness of consequences* is defined as whether someone is aware “of the adverse consequences of not acting pro-environmentally (De Groot & Steg, 2009, p.189).” While “[A]scription of responsibility, is described as feelings of responsibility for the negative consequences of not acting prosocially (De Groot & Steg, 2009, p.426).” Together, I assumed that the realization of the importance of a normal climate for a pleasant daily life, as well as becoming aware of one’s own impact, consequences and responsibilities, would increase intentions and pro-environmental behaviour. Therefore, measures for those concepts were included in three out of four studies (see Table 2).

In Study 3, no other cognitive concepts were included, however, eye-tracking data was collected to provide a measure for the level of visual attention the viewers were paying to the piece of art (Brieber, Nadal, Leder, & Rosenberg, 2014; Duchowski, 2017; Quiroga & Pedreira, 2011) and the depth of the cognitions (Duchowski, 2017). Details on the method and its implications can be found in section 3.2.4 below.

Environmental cognitions include thoughts on *systems thinking and environmental concern*. These are especially relevant in the context of the PPs, the piece of art under investigation in Study 4. Pinsky created the PPs to highlight the interconnectedness of global systems (Pinsky, 2017). *Systems thinking and environmental concern* is a concept based on research by Lezak and Thibodeau (2016), which includes items on the interconnectedness of (1) the temporal scale, (2) peoples' personal place in the system and (3) collaboration among people and nations (interpersonal literacy). The reflections on connected systems are related to cognitive barriers or facilitators of climate change action - one important barrier to environmentally friendly behaviour is the disconnect between our behaviour now and its impact in the future (Lorenzoni, Nicholson-Cole & Whitmarsh, 2007). Therefore, reflections on the time scale and long-term impact of peoples' actions are vital to raise awareness for climate change. Apart from being temporally connected, our systems and lives are also geographically linked. Meaning that through globalization our actions in one place can have dire consequences for people in other places. Reflecting on this interconnectedness and one's place in the economic system is important for motivating pro-environmental behaviour (Moser, 2010). The last aspect of the systems thinking concept (Lezak & Thibodeau, 2016) is emphasizing interpersonal relations, and the necessity of collaboration between people and nations, to reach international climate goals (IPCC, 2018). We hypothesized that all three aspects would be provoked by a visit to the PPs and lead to an increased intention to act.

Pro-environmental intentions have been associated in many studies based with the Theory of Planned Behaviour (Ajzen, 1991), used as a theoretical predictor of environmentally friendly behaviours (e.g., Nordlund & Garvill, 2003; Stern et al., 1999) and policy support (Gärling, Fujii, Gärling & Jakobsson, 2003; Steg, Dreijerink & Abrahamse, 2005). We assumed that intentions to act on climate change would be triggered by the perception of environmental art and therefore included it as dependent measure in Study 3 and 4.

1.5 Research Questions and Hypotheses

To summarize, art perception and environmental psychology offer ample theoretical material on how environmental art can be associated with environmental intentions and behaviour. The general idea is that art opens a space for the viewer to feel, reflect and develop a personal interpretation of the topic of climate change, as opposed to just being given factual information. The following research questions and hypotheses were formulated in the four articles comprising this dissertation:

In Study 1, the effect of visual, activist and environmental art on its spectators, is investigated. This exploratory study aimed to identify characteristics of art that were associated with certain emotional and cognitive reactions to the environmental artwork. The results could be used to inform climate change campaigners and artists on how to better reach out to their audiences and create engagement through their work. Therefore, the following three research questions were formulated:

RQ 1.1: Do environmental pieces of art (as a case of activist art) trigger different profiles in emotional reactions by the audience, which can be grouped in homogenous clusters?

RQ 1.2: Do these clusters also correspond to differences in climate change related cognitions and artist perception?

RQ 1.3: To which emotional and cognitive patterns do different characteristics of artwork relate?

In Study 2, a model framework is suggested that describes the mechanism of environmental art perception, with emotional and cognitive reactions leading to climate change policy support. This model describes how we hypothesize the different variables to relate to each other, and for this reason no specific research questions were formulated in addition to the suggested model. The aim of Study 2 was to research how environmental art can increase an individual's support of climate policies and if artwork based on their features have different impacts.

Study 3 investigates the context in which environmental art is being presented, specifically how contextual information affects the emotional and cognitive reactions to the piece of art, including the intention to act pro-environmentally. This is important, given the many ways environmental art can be presented to the public. The following research questions were formulated:

RQ 3.1: Does the presentation of environmental art with vs. without contextualizing information influence the art experience?

RQ 3.1.1: Do previous findings concerning the effects of contextualizing information (e.g. increased meaning, understanding, or aesthetic appreciation through information presentation) translate to the experience of environmental art?

RQ 3.1.2: Can additional effects relevant to environmental communication be attributed to presenting environmental art with vs. without contextualizing information?

Lastly, the piece of art used in Study 4 and the research around it represents the culmination of the Climart project. It embodies the common efforts of the transdisciplinary group of researchers and artists - to create art that increases engagement with climate change. Study 4 investigates the association between the PPs and the self-reported emotions, cognitions and pro-environmental intentions and behaviours the visitors experienced. The following hypotheses were formulated:

H 4.1: Pro-environmental behaviour will be stronger in a group of visitors of the PPs as compared to a comparison group who did not visit the Pods.

H 4.2: Pro-environmental intentions will be stronger after the experience of the PPs than before, and stronger than in comparison to a group of people not exposed to the PPs.

H 4.3: Emotional activation (both negative and positive) will be positively associated with increased intentions to act in PP visitors.

H 4.4: Cognitions (general reflections and meaning-making, systems thinking, awareness of consequences, ascription of responsibility) will be positively associated with pre- to post-increase in the intentions to act in PP visitors.

2. Aims

The aim of this dissertation is to bring together the fields of environmental art, art perception, and environmental psychology to investigate the association between environmental art, emotions, and environmentally relevant cognitions. Thereby, this thesis attempts to shed light on the underlying mechanisms of environmental art perception. The assumption is, that environmental art might open a space for reflection instead of simply serving information or educating people. This space would then allow them to take a step back and find their own meaning in the art, together with a personal connection and motivation to act on climate change. The research questions and aims of each study were formulated based on the theories presented in the introduction and on three occasions to collect data, which presented themselves within the framework of the Climart project.

The goal of Study 1 was to develop an understanding of what characterizes and defines an environmental piece of art, that makes people feel and think in a certain way. It explores commonalities of artwork that lead to similar psychological reactions. Study 2 shifts the attention from the art to the audience. It aims to identify the mechanisms of environmental art perception and how this mechanism interacts with characteristics of the art. Study 2 tries to answer questions such as, how an art experience can increase an individual's support of climate policies, and whether different artworks based on their characteristics do this differently. To do so, a two-level model was defined and tested. Both studies included data from an art festival which was organized by one of the Climart project partners, Cape Farewell. The festival took place around the Conference of the Parties 2015 (COP21) in Paris and was called ArtCOP21. It offered the possibility to study a wide range of different types of art, which were dedicated to raise awareness for climate change.

The goal of the third study was to investigate the effect that contextualizing information on climate change had on the perception of an environmental piece of art. Studies on art perception found that viewers reported more 'liking' and to perceive more 'meaning' from art with a title or accompanied by informative text (Lin & Yao, 2018; Bubić, Sušac & Palmović, 2017). Thus, the goal of Study 3 was to investigate whether provided information also influenced the liking and meaning of a piece of environmental art, as well as the emotions, cognitions and self-reported intentions to act on climate change. The data collection for the third study was carried out in the laboratory, which allowed a more controlled setting than in the field in Paris. Eye-tracking methodology was employed to give insight into the visual responses and depth of cognitive processing of the art.

The last study investigates the emotional and cognitive reactions of visitors to the PPs and associations of these psychological reactions to the intentions to act and pro-environmental behaviour. Data was collected at the first two exhibitions in Trondheim and London. After these two exhibitions, the PPs went on a worldwide tour, with a total of 9 shows in Geneva, Bremen, Melbourne, Toronto and New York, amongst others. To date more than 30 000 visitors have experienced the PPs.

3. Methods

This section reviews the methods conducted in order to satisfy the overall aims of this thesis. As mentioned in the introduction, the Climart project provided room for two dissertation projects which are distinguishable both thematically and methodologically. For insights on the qualitative work conducted within the Climart project as well as the topic of narratives told by environmental art on climate change, please refer to Roosen's dissertation (2020). The present dissertation used mostly quantitative methods, such as, survey questionnaires and eye-tracking, which were analysed with statistical methods. Data was collected in the field in Paris (France), Trondheim (Norway) and London (United Kingdom), as well as in a laboratory in Darmstadt (Germany).

This section will provide an overview of the experimental setup of the studies, the data collection procedures, the measures, the samples, as well as the statistical approaches used to analyse the data. The methods will be presented study by study, because they were specifically selected to answer the research questions and the art on which the studies were based. Where possible and applicable, the methods were built on established methodologies or measurement instruments and were adapted to the environmental art context. Study 1 and 2: Investigating a wide range of environmental artworks, their characteristics and psychological processing mechanisms based on data collected at the ArtCOP21

3.1. Study 1 and 2: Investigating a wide range of environmental artworks, their characteristics and psychological processing mechanisms based on data collected at the ArtCOP21

3.1.1. Experimental setup

The goal of the first and second study was to develop an understanding of the emotional and cognitive reactions of spectators to environmental art and associate these reactions with characteristics of the artwork. To do so, data was collected at the ArtCOP21²¹, an art festival exhibiting an extensive range of environmental artwork. The ArtCOP21 took place all over the world at the time of the 21st UN Conference of the Parties on Climate Change (COP21). Most events were located in Paris, where the COP21 itself took place. The concept of the festival was that museums, galleries and campaigners could independently register their exhibitions or artwork as part of the festival. This resulted in a diverse variety of environmental art, installations and performances, all with the uniting theme of inspiring change for climate mitigation and adaptation.

²¹ <http://www.artcop21.com/>

Study 1 focuses on the artwork as unit of analysis, whilst Study 2 takes the perspective of the audience members into consideration and therefore uses participants as the focus of analysis. Cluster analysis was chosen as the statistical methodology for the first study to identify commonalities among artwork. For the second study, a Structural Equation Model (SEM) was selected to uncover the structure of the psychological reactions to the artwork from the audience. These two statistical approaches made the best use of the diversity of artwork exhibited at ArtCOP21 and will be introduced below, after the data collection procedure and description of the survey items and sample.

3.1.2. Data collection procedure

To gain a list of potential exhibitions of artworks at the ArtCOP21, I scanned the website of the festival for 'visual art' to be exhibited during the time period of COP21 (30.11.-12.12.2016). Of these, 50 events were registered in Paris alone and suitable for our data collection. We, two PhD-candidates plus two student assistants, formed two field teams who set out to collect questionnaire data from the viewers of these pieces of art. Both teams were assigned three to four pieces each day, over a course of eight days, between the 5th and 12th of December 2015. The artwork being assessed by one team on a single day had to be in relatively close proximity to each other. A substantial challenge was posed by the terrorist attack on 13th of November 2015 in Paris, which took place shortly before COP21 and the data collection. This meant that some of the events were cancelled while others were transferred to a different location. Therefore, the teams had to be flexible and adjust their schedule according to changing circumstances.

For a SEM approach, a minimum of twenty participants per artwork were required, to provide enough responses on level 1 (number of visitors) and level 2 (number of pieces of art) in order to get meaningful results from the explained variance on level 1 (Kreft, De Leeuw & Aiken, 1995; West, Ryu, Kwok & Cham, 2011). Each team tried to collect around 30 questionnaires, before moving on to the next piece. The number of responses obtained was highly dependent on the popularity of the respective art. Some places were popular and busy (for example, Le Bourget and the Grand Palais), making data collection relatively easy. Other locations were remote and not as popular, attracting fewer visitors, thereby, impeding the data collection success (one example was 'Climate is on the wall', which was graffiti art in the surroundings of the Metro station Jaurès, where very few people were available to participate). Therefore, one team travelled back to Paris in January 2016 to collect more data from an exhibition, which was part of ArtCOP21 but continued beyond the timeframe of COP21 (at Galerie Amarrage, artworks 20-27, see Table 1 in Study 1).

Participation in the study was voluntary but entry into a lottery was offered as an incentive. The assistants were trained to approach each potential participant in the same way, whilst still trying to keep the recruitment as natural and engaging as possible. Table 1 in Study 1 gives an overview of the locations and artwork data was collected on, as well as the number of questionnaires collected per piece of art.

The fact that the artwork was exhibited in a diverse range of venues, from gallery spaces, to renowned art museums or public parks and in the surroundings of a metro station, suggests that a diverse range of people would have been part of the sample. Most events were at the venue not recognizable as part of ArtCOP21. It can, therefore, be assumed that most viewers did not know they were part of an 'environmental art festival', which reduced the probability that visitors were primed with the topic.

Artwork characteristics. To be able to relate the psychological reactions of participants to features of the artwork, additional information on the art was collected. The data collection team rated each piece of art on a list of features, which included whether it was a painting, sculpture or installation, whether it was colourful, what materials it consisted of, whether it was participatory and so forth. Examples of artwork included in the data collection can be seen in Figures 3 to 5 and the list of artwork characteristics can be found in the Appendix.



Figure 3 Installation 'L'eau qui dort' by Michael Pinsky (picture courtesy by the artist)



Figure 4 Photography exhibition 'Honey Roads' by Eric Tournet (picture courtesy by the artist)



Figure 5 Painting 'Venues of the Trash Isle' by Jave Yoshimoto (picture courtesy by the artist)

3.1.3. Measures

Since data was collected in the field, the questionnaire needed to be kept short. It was designed in English and translated to French by a professional translator and answering it took approximately 10-15 minutes. Furthermore, the two language versions were checked for congruency by a fluent speaker of both languages and mistakes were corrected.

Questionnaire items. The first part of the survey asked for socio-demographics of respondents (*age, gender, education*), including one question on *art experience* and a second on the *perceived quality of the artwork*. Art experience was measured by the statement "Your experience with art:" and the inversely coded answers 1 "I am an art lover and go to exhibitions regularly", 2 "I like art, but I am not an art connoisseur", 3 "Sometimes I like art, sometimes I do not – it depends", 4 "I don't really like art, but there are some exceptions" and 5 "I really dislike art". Perceived quality of the artwork was measured on a 7-point Likert scale ("The artwork seems to be of considerable artistic quality") ranging from 1 (strongly disagree) to 7 (strongly agree).

This was followed by variables on emotional reactions to the artwork, asking participants how much they felt the positive emotions *happiness, hope, a sense of awe, inspiration and enthusiasm*, as well as *surprise* and the negative emotions *guilt, sadness and disappointment, apathy and helplessness, anger* as well as *anxiety*. The emotions were measured again on a 7-point Likert scale from 1 (not at all) to 7 (very much).

Ten cognitive variables (see Table 3) measured the thoughts the participants had when encountering the art, with the answering format from 1 (strongly disagree) to 7 (strongly agree). Another item in the questionnaire included *environmental attitude*, asking participants to "Compare yourself to others; how interested would you say that you are in environmental issues". The answer could be given on a 7-point Likert scale from 1 (far below average) to 7 (far above average).

To assess participants' priorities for climate change related policies, a list of eight policy areas was presented and participants were asked to rate the importance of each on a four-point ordinal scale (1=it is rather unimportant in comparison [in comparison to the other suggested policy areas], 2=it is not that important to me, 3=it is important but not the highest on the list, 4=it should have the highest priority).

Table 3 Survey questions (left column) measuring underlying cognitive constructs (right column) related to environmental awareness and behaviour included in Study 1 and 2

What are your opinions about the artwork?	Cognitive constructs
1. The artwork has something unusual, which made me stop and look at it in more detail.	1. Potential to make people stop/step out of daily routine
2. The artwork makes me think and reflect on its meaning.	2. Contemplation
3. The artwork seems relevant to my daily life.	3. Relevance for daily life
4. The artwork highlights consequences of climate change that would affect me personally.	4. Personal consequences of climate change
5. The artwork gives me a sense of belonging to a group of like-minded people for whom the artwork speaks.	5. Sense of belonging to a group
6. The artwork is confrontational, i.e. has a shocking or aggressive undertone.	6. Confrontational and challenging social norms
7. The artwork makes me think about the problem of climate change.	7. Reflections on climate change
8. The artwork makes me think about my own role within the current climate situation.	8. Personal role within climate change
9. The artwork makes me more aware of my behaviour's impact on the environment.	9. Awareness of personal impact
10. The artwork challenges rules and social norms in our society.	10. Challenging social norms
On a scale from 1 to 7, what kind of person do you imagine the artist to be?	
1. Someone like yourself	Identification with the artist
2. Someone thinking and living differently than most people.	
3. Someone with values similar to yours.	
4. Someone expressing the view of the public.	
5. Someone expressing the views of a minority.	

3.1.4. Sample

The ArtCOP21 sample included an average of 24 participants per event (with a range of 15 to 38) and a total of 883 participants, of which 490 were female (56%) and 382 male (44%, missing = 1%), most of whom were of French nationality (n = 621, 70%). Other nationalities included Dutch, Spanish, US American, British (with 2% for each nationality), and 22% others with each nationality accounting for less than 2%. The mean age was 36.62 years (SD = 16.43), which indicated a fairly heterogenous distribution in the sample, with 68% of participants being between 20 and 53 years of age. The level of education was high among participants with 69% having a university-, 9% a college-, 15% a high school-, and 4% a primary school degree (missing: 2%). Regarding their art expertise, 33% of participants described themselves as art lovers and said they went to exhibitions regularly; half of the participants (50%) stated that they like art but do not consider themselves connoisseurs; a minority of 14% stated they sometimes liked art and sometimes did not; very few participants (2%) pointed out that, with some exceptions, they do not really like art and even fewer (1%) said they really disliked art and anything related to it. It can be highlighted that the level of art expertise varied a lot between the visitors of the artwork exhibited in different places. Especially at artwork exhibited in public and in non-art venues, up to 40% of participants described themselves as "sometimes liking, sometimes disliking art" or "not liking art". Lastly, the participants at the ArtCOP21 reported environmental attitudes with a mean of $M = 5.28$ ($SD = 1.21$).

3.1.5. Statistical approach

Statistical approach Study 1 – Cluster analysis. The statistical method of choice to answer the research questions of Study 1 was the data analysis technique called “Cluster analysis”. Cluster analysis is based on the grouping of cases due to their similarity in the response patterns on one or several variables. The goal is to define a number of ‘clusters’ or groups of cases, that are as homogeneous as possible within, and as heterogeneous as possible between clusters. The similarity between cases is described by the distance between each case on the defined variables (Schmidt & Hollensen, 2006, p.330-374). In the case of the environmental artwork exhibited in Paris, this meant to identify patterns of emotional reactions, to be as similar within, but as different as possible between clusters of artwork.

There are different types of cluster analysis techniques, as can be seen in Figure 6. These include overlapping vs. non-overlapping, hierarchical vs. non-hierarchical, as well as divisive vs. agglomerative cluster analyses. The method of cluster analysis can be interpreted as a qualitative technique even though it is based on questionnaire responses (Namey, Guest, Thairu & Johnson, 2008, p.146). This is because there is no objectively better or worse version of clusters. The choice of clustering technique and, thereby, its cluster solution is based solely on the theoretical assumptions and the researcher’s interpretation. It is common practice to apply several clustering methods to compare results before concluding on the most satisfactory cluster solution.

The cluster analysis started with the assumption that each piece of art is a cluster, followed by grouping the closest pieces together, then the next closest clusters and so forth until the process results in one mega-cluster. The criterion which defines the distance between the clusters is called linkage (Schmidt & Hollensen, 2006, p.369). Different kinds of linkages can be chosen to approximate the cluster solution which is most representative for the data.

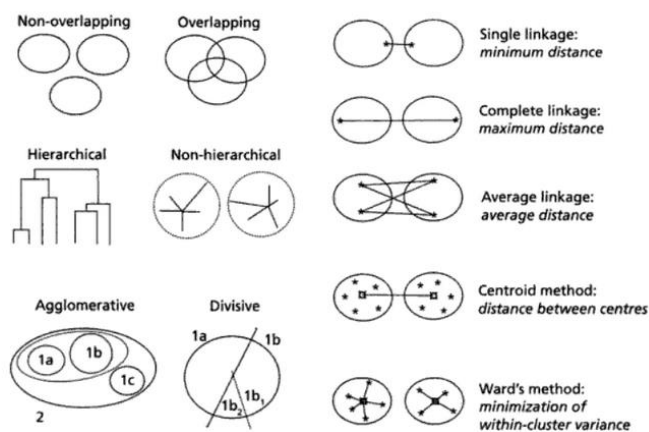


Figure 6 Illustration of different clustering techniques, taken from Schmidt and Hollensen (2006, p. 332) with permission by the author

In preparation for the cluster analysis, the self-reported emotional responses were averaged across visitors for each piece of art resulting in one value per emotion variable per piece. These mean values were then used as input variables for the cluster analysis. This meant that the clustering of art was based on the emotional responses triggered, as it was assumed that, in the process of environmental art perception, emotions were activated before cognitive reactions.

SPSS 24 was used for the analysis. The first step of the clustering process was to create dendrograms, which are diagrams in the form of a tree, that showed “at which distance an observation joins another observation or a cluster or at which distance a cluster joins a cluster” (Schmidt & Hollensen, 2006, p.340). These dendrograms illustrated when the algorithm merged single pieces of art together and eventually clusters with each other. Based on the clustering technique, the dendrograms illustrated differences among the cluster solutions and made a direct comparison possible. After testing all approaches, the hierarchical and agglomerative Ward’s method was chosen, because it resulted in the most logical and easy to interpret solution, based on the emotional reactions of spectators. Figure 7 shows the dendrogram of the Ward’s method of the ArtCOP21 data.

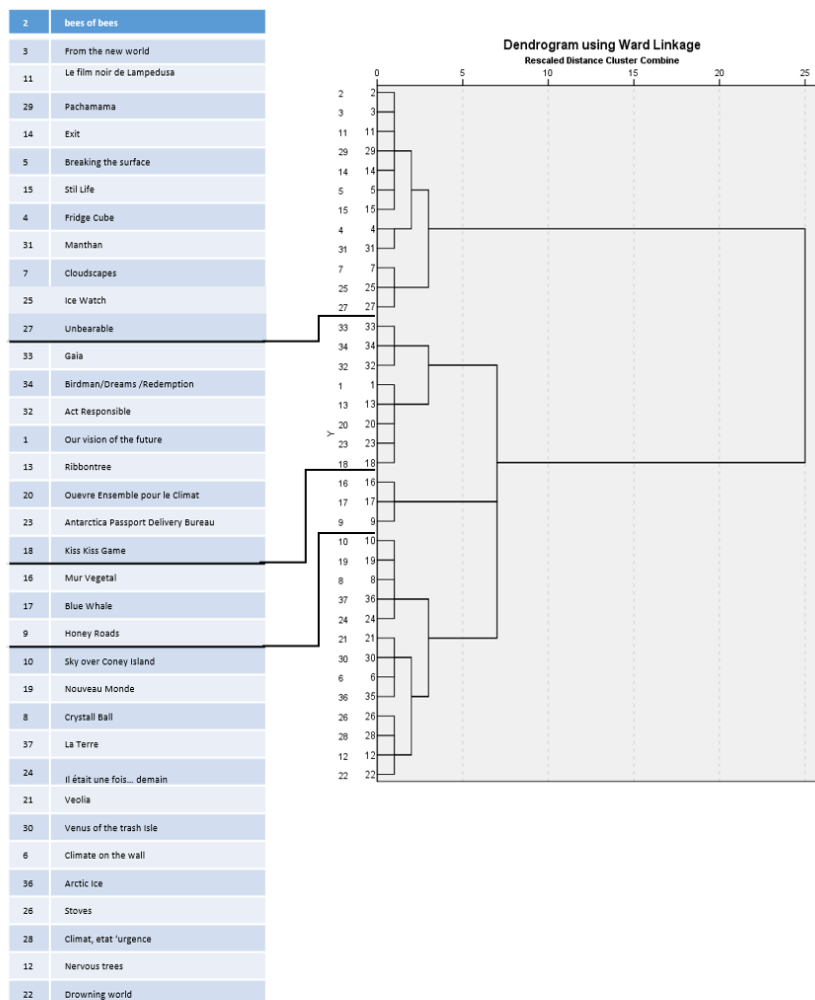


Figure 7 Resulting dendrogram and the according artworks of cluster solution provided using Ward’s method.

Statistical approach Study 2 – Structural Equation Modelling. The data analysis technique applied in Study 2, was Structural Equation Modelling (SEM). SEM is not one specific, but a family of statistical techniques, just as in the case of cluster analysis techniques. It is strictly speaking a confirmatory approach, which means that SEM is used in cases where

the researcher tries to confirm a theoretical model of how certain variables relate to each other (Kline, 2015, p.9). SEM illustrates relations among observed and latent variables for several possible theoretical models. Latent variables are variables that are not directly measured or observed, but they are inferred from several observed variables and measured with, for example, surveys (Schumacker & Lomax, 2015, p. 2). Put differently, the observed variables create together a latent construct, and the initial grouping of observed variables is based on theory. In the case of the ArtCOP21 study, several observed variables represented the latent construct “identification with the artist” or “reflections on the meaning of the artwork” in relation to the environment. Additionally, these latent variables were hypothesized to be connected in a certain way - SEM enables the researcher to test the relations among the variables and whether the construct is supported by the sample data (Schumacker & Lomax, 2015, p. 1).

To do so, SEM combines a confirmatory factor analysis and a regression approach, while considering the potential error of measurement indicators (Schumacker & Lomax, 2015, p. 64). The consideration of the measurement error is especially important, because variables that are unreliable due to a measurement error combined with a potentially mis-specified model, do not embody theory well (Schumacker & Lomax, 2015, p. 63).

In the case of the ArtCOP21, the data had a clustered two-level structure. Each participant (Level 1, person-level) answered the questionnaire in one of 37 different ‘groups’, dependent on which artwork the participant had seen (since each audience member was surveyed only about one piece of art). This allowed us to test the influence of characteristics of the art (Level 2, artwork-level) on emotional and cognitive reactions, simultaneously with the relationship between emotions and the conceptually following cognitive concepts.

According to this methodological framework, the analysis strategy for the second study contained first, a confirmatory model factor analysis to test the measurement model. This step was based on the theoretical constructs presented in the introduction, including the latent variables “positive” and “negative emotions”, “perceived quality of the artwork”, “identification with the artist”, “reflections on the artwork”, and “climate change policy support”. Afterwards, a theoretically derived structural model was specified on the person-level, only controlling for the effect of the clustered data structure. Next, we investigated whether the variables from the person-level model varied among different pieces of art dependent upon the characteristics of the art (artwork-level). To do so, we first established that there was meaningful variation in these variables from the person-level model between artwork. Then the artwork-level model was specified, to test which of the different artwork characteristics could explain a significant level of variance in the average emotional and cognitive response of participants between the artwork.

3.2. Study 3: Investigating the impact of contextual information on the perception of environmental art

The results of the first two studies indicated that the context, for example, the location in which the artwork was exhibited or whether information on solutions to climate change were given, influenced the perception of the artwork. Study 3 investigated the influence of contextual information on emotional and cognitive reactions to environmental art.

3.2.1. Experimental setup

Study design. The aim of the third study was to investigate the effect of information accompanying environmental art on emotional reactions to the artwork, as well as reflections about climate change, and pro-environmental intentions and actions. A laboratory setting was chosen to ensure a high level of control over the surrounding factors of the art. As part of the set-up, we decided that only one piece of art should be shown even though more artwork would have improved the generalizability of the results of the study. An exhibition featuring several pieces of art would have made it difficult to distinguish between the effects of the different pieces and their contextualizing information on the spectator. Moreover, a complex study design with several pieces of art would have required randomization of showing the different pieces of art, to cancel out order effects. This was not in the scope of the study and it was therefore decided to investigate the research question with only one piece of art.

As an indicator for the visual attention focused on the art, gaze patterns are frequently used in laboratory studies on art perception (Duchowski, 2017), especially the viewing time and number of fixations (Brieber, Nadal, Leder, & Rosenberg, 2014; Duchowski, 2017; Quiroga & Pedreira, 2011). Mean fixation durations on the other hand can be seen as indicator for higher cognitive functioning (Duchowski, 2017). Therefore, eye movements were incorporated in this study to gain further insight into the mechanisms behind environmental art perception.

Selection of artwork. The selected piece of art was the painting “Landscape of Change” by Jill Pelto (see Figure 8), depicting data lines shaping a landscape created by climate change. The lines represent sea levels rising, melting glaciers, the increase in global temperatures and of fossil fuels, thereby visualizing scientific climate change related data that represent changes in nature and ecosystems. The data lines represent the most characteristic feature of the painting and define the narrative of the work (Pelto, 2017).

Regarding the question what qualifies as art- the artwork had to be easily identifiable as such. This was the case for “Landscapes of Change” – which was confirmed by asking five students at NTNU prior to data collection whether they would identify the painting as “art” (these participants were excluded from the main experiment). Another selection criterion was the level of ambiguity the artwork needed to have for the presented information to have an impact - the meaning of the painting needed to be not too obvious, neither too abstract. When asked about their associations to the artwork, the same participants in the pre-test mentioned the topic of landscapes, nature and the elements, thereby demonstrating a reasonable diverse range of associations possible for “Landscapes of Change”.

Further supporting the argument that this painting could be considered environmental art, Jill Pelto states that her artistic practice is inspired by scientific findings and empirical data on environmental changes due to climate change, which she incorporated into her paintings, as is a trend in contemporary environmental art (Jacobs, Benford, Selby, Golembewski, Price, & Giannachi, 2013). Choosing a piece of art which followed this trend made the findings more generalizable, since the underlying theme is in principle generalizable to other paintings and artwork trying to communicate the urgency of the climate crisis.

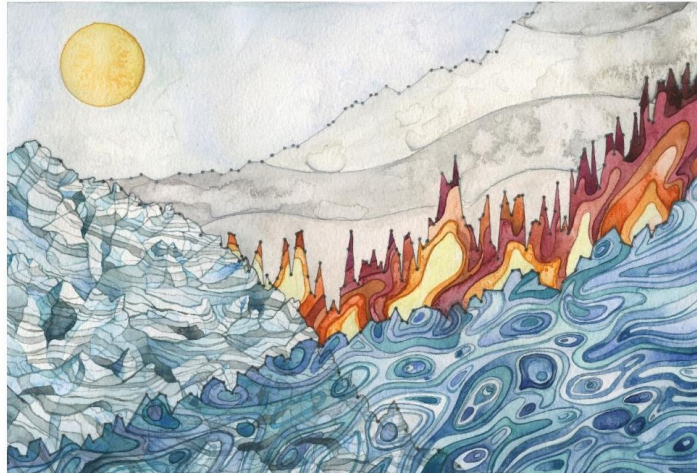


Figure 7 Landscape of Change by Jill Pelto (Pelto, 2017). Pictured with permission of the artist.

Laboratory set-up. The experimental set-up had two conditions: 1) Information on and exposure to an environmental artwork and 2) no information on but only exposure to an environmental artwork. The contextual information was operationalized as information about the artwork and the artist and was presented as a 40 x 20cm poster.

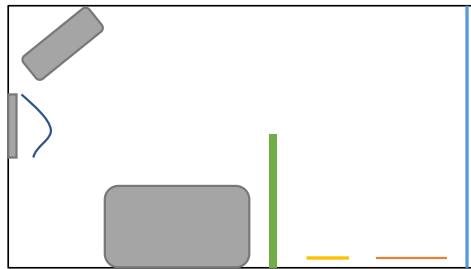


Figure 8 Laboratory assembly, in orange = room dividers, blue = window, green = furniture, purple = information poster (if applicable), red = artwork

Studies have shown that elaborate and content-specific information helps to enhance an aesthetic experience (Leder et al., 2006; Swami, 2013). The information poster was shown to participants in the information group right next to the artwork itself, as in the setting of a museum or gallery. This was done to ensure that the information would serve to put the artwork into context and encourage increased contemplation, and not given as additional information as is done in climate change engagement campaigns. In the no-information conditions, participants saw the artwork without any information. Figure 9 shows the set-up of the laboratory. The information for the poster was taken from Jill Pelto's website, where she describes the painting. The text on the information poster can be found in Study 3.

3.2.2. Data collection procedure

Data collection took part in Germany, at Darmstadt's University of Applied Sciences. Most participants were recruited from the business psychology program via email lists and social media, of which 41% of participants (n = 51) were first

year students, who received course credit for participating in the study. To recruit participants from other study programs, flyers were handed out all over the campus. During the recruitment process potential participants were told that the goal of the experiment was to investigate “how people look at art”, to avoid any priming effects regarding environmental topics. Furthermore, participants needed to have no visual impairment but could otherwise wear contact lenses. This requirement was enforced so the participants were able to wear the eye tracking apparatus for the experiment. Participants were randomly assigned to the information condition (n = 66, 54%) and no information condition (n = 57, 46%) using an excel random number generator.

3.2.3. Measures

Questionnaire – Independent variables. The questionnaire was handed to the participants in German and translated into English for the publication. The items were presented to the participants in different blocks, with the order of items within each block being randomized for each participant (the questionnaire was shown on a computer screen). The first set of independent variables included in the questionnaire measured the aesthetic experience of the painting. Participants were asked to give ratings on two items to express how much they liked (“I like this artwork”) and how interested in the painting they were (“I think this artwork is interesting”). Their response ranged from “fully disagree” to “fully agree” on a 7 point-Likert scale and thereby gave an estimation of their appreciation of the art.

In order to measure the meaning associated with and contemplation of the artwork, a four-item scale from Silvia (2005), adapted by Swami (2013), was used. This covered the diverse aspects of art that could make people find meaning in it. The items were: “I felt able to understand the artwork”, “this artwork was easy to understand”, “I could get a sense of what the artist wanted to express” and reversed scored “this artwork was basically meaningless”. A reliability test showed that when the fourth item of that scale was removed, the scale’s internal consistency increased from $\alpha = .82$ to $\alpha = .88$. The item was therefore removed and the reduced scale was transformed into an index variable called “meaning”, represented by the mean of the three remaining items.

Regarding emotional reactions, participants were asked whether the artwork made them feel the emotions *anger, guilt, pride, shame, sadness* and *fear* with answers on a 7 point Likert scale ranging from “not at all” to “very intensely” (Rees et al., 2015; O’Neill & Nicholson-Cole, 2009). Participants could, on the same scale, indicate that they did not feel emotionally touched. Next, all items measuring emotions were put into a principal component analysis (PCA), with oblimin rotation. The cut-off criterion was Eigenvalues larger than one, used to determine the number of factors represented by the data. For factor (cross-) loadings a criterion level greater than .3 was chosen for inclusion of items. The result was two factors, the first comprising the four items *shame, anger, guilt, sadness, and fear* which explained 51% of variance. *Pride* was the only item forming the second component, which explained 17% of total variance. The item “emotional coldness” loaded with -.49 and -.50 on both components and was hence excluded from analysis. The mean was calculated across all items of the first component to create an index variable “eco-emotions”, reaching an internal consistency of Cronbach’s $\alpha = .88$. For the single variable pride no index variable needed to be computed.

Questionnaire – Control variables. Several variables were recorded as control measures. One item asked whether participants had seen the painting already somewhere before. Environmental values were measured as control variable with a scale developed originally by Schwartz (1992) and adapted by Steg and colleagues (Steg et al., 2011; Steg,

Dreijerink, & Abrahamse, 2005). The scale asked participants to rate how important twelve values were for them in their daily lives. Answers were given on an 8-point scale ranging from -1 (opposed to the value), over 0 (not at all important) to 7 (of supreme importance). The value scale consisted of twelve items, comprising three subscales with four items each: Egoistic values including wealth, authority, social influence and power (Cronbach's $\alpha = .76$); altruistic values consisting of equality, social justice, helpfulness and a peaceful world (Cronbach's $\alpha = .69$) as well as biospheric values consisting of protecting the environment, preventing pollution, unity with nature and respecting the earth (Cronbach's $\alpha = .84$). The index items called egoistic values, altruistic values and biospheric values were created for each subscale.

Two items were used to assess familiarity or experience with art in order to control for its potential effect on responses to the piece of art. One item assessed participants' interest in art ("How much are you interested in art?") measured on a 7-point Likert scale from "not at all" to "very much". A second item was asking for frequency of exposure ("How often do you engage with art?") ranging from "never" to "very frequently". For the analysis, the two items were combined into an index variable called "art familiarity" (Cronbach's $\alpha = .87$).

Socio-demographics were collected in the final block of the survey. Questions about gender, age, level of education and whether participants had a visual impairment or not were included.

Questionnaire - Dependent variables. As dependent variables for environmental engagement triggered by the artwork, intentions to act pro-environmentally were measured. To do so participants were asked to rate the statement "I plan to (continue to) deliberately act pro-environmentally in my everyday life" on a 7-point Likert scale from 1 (fully disagree) to 7 (fully agree). As distractors from the pro-environmental intention item and to set the questions more in the context of studies on art, two items were added around the pro-environmental intention item ("I plan to see more works of this artist" and "I plan to engage more with environmental art") which were not included in the analysis.

Along with intentions, a pro-environmental behaviour measure was implemented by offering participants the option to take part in a lottery. The prize was one of four Amazon coupons with a value of 50€, 40€ and 2 x 20€. When participants were finished with the experiment, they could choose to write their email address down on a piece of paper slipped into one of two envelopes. The first envelope was marked with "In case of winning in the lottery, I choose to receive my win as an amazon.de voucher" while the second read "In case of winning in the lottery, I choose to donate my win to an environmental organization (CO₂ compensation – www.climate.org)". If participants chose to put their paper in the envelope with donating to the environmental organization, this was interpreted as environmentally friendly behaviour.

3.2.4. Eye tracking measures

To measure gaze patterns, eye movement was recorded using mobile eye tracking glasses (ETG) produced by SensoMotoric Instruments. Apart from the mobile ETG, the system contained a smart recorder the size of a smartphone making it possible for the participants to move through the laboratory without limitation. The eye-tracking system gathers binocular data with a sampling rate of 60 Hz and an accuracy of 0.5° with parallax compensation. Before the experiment started, a 3-point calibration was done, and if needed, corrected offline.

SensoMotoric Instruments' BeGaze software (Version 3.5; SensoMotoric Instruments, 2015) was used to prepare the eye tracking data for analysis and after checking the data for obvious errors, $n = 91$ cases²² were included in the analysis. First, the art and its semantic regions, represented by the lines of climate change data in the painting, were marked as areas of interest (AOI). For the number of fixations and mean fixation duration, the fixations of participants were automatically identified by the software using a dispersion-based algorithm. Afterwards, the fixations were manually mapped onto the artwork, making it possible to compare the eye movements across participants.

Next, the viewing time, number of fixations and the average duration of fixation were computed as numeric eye tracking statistics for the AOIs. The viewing time was defined to begin with the first fixation and end with the last fixation before leaving the AOI. The average duration of fixations was calculated across all fixations on an AOI. Finally, the number of revisits to the data lines was computed.

3.2.5. Sample

Overall, 123 participants could be included in the questionnaire part of the study. Of these, the eye-tracking data of 91 participants was obtained. Two participants had to be excluded because they knew the artwork already. Most participants were women (74%, $n = 91$) with an overall age range between 18 and 54 years ($M = 23.58$, $SD = 5.96$). Education levels were high, as was to be expected since recruitment took place at the university, with 14% holding a university degree ($n = 18$), three quarters having reached the German equivalent of A-levels (75%, $n = 92$), 8% having finished vocational schooling ($n = 10$), 2 % lower secondary education ($n = 2$) and 1% with other education ($n = 1$). Familiarity with art had a mean of $M = 3.39$ ($SD = 1.32$), slightly below the middle point of the 7-point scale, while biospheric values were slightly above midpoint with a mean of $M = 4.70$ ($SD = 1.50$) on a 9-point scale (as mentioned above, the measured values were part of the covariates).

3.2.6. Statistical approach

Group comparisons between the information and no-information groups were calculated and the dependent measures assessed in the questionnaire and with the eye-tracking device. For this, independent t-tests were used or, if the assumptions for parametric tests were not met, Wilcoxon rank sum tests. The second step of the analysis consisted of a mediation analysis to investigate whether the relationship between the information conditions and the aesthetic experience, in the form of liking or the emotional reactions shown to the art, would be mediated by the meaning participants discovered in the painting. To do this, four-step mediation testing (Baron & Kenny, 1986; Tofighi, 2020) was employed, calculating first the individual effects of the variables, followed by a test of the indirect effects, including non-parametric bootstrapping of the regression parameters where necessary.

²² The relatively high drop out in participants for the Eye-tracking measures (32 participants, 25% of the overall sample) was due to problems with the calibration on one of the ETG devices.

3.3. Study 4: Investigating associations between psychological reactions to the Pollution Pods and pro-environmental intentions and behaviour

3.3.1. Experimental set-up

As described in the introduction under section 1.1.3 – Phase 4, Michael Pinsky was commissioned to create an artwork that would engage its audience with the topic of climate change. Taking the findings from Studies 1 and 2, as well as Roosen et al.'s (2017) literature review, into consideration, he created an installation on air pollution and climate change, called Pollution Pods (PPs). This installation is the stimulus for Study 4 and will be described in the following section.

The Pollution Pods. The PPs provides its visitors with a live immersive experience of the global problem of air pollution. The installation consists of five geodesic domes, connected to each other in the shape of a ring. Each dome represents one location from around the world, featuring the air pollution typical for those locations. The smell-mixture that the visitors of the PPs inhale, is, in contrast to the air in the real-world locations, safe and non-toxic. The five represented locations are: Tautra/Trondheim²³, Norway; London, UK; New Delhi, India; Beijing, China and São Paulo, Brazil (in the order of how visitors experience the installation). The dome representing Tautra contains the cleanest air²⁴, followed by London, mimicking the diesel smells from traffic and slight fog. The third dome embodies New Delhi, the city with the worst air pollution world-wide, including burned plastic and rubbish on the streets, as well as burned fields on the outskirts of the city to increase crop yield. Conditions in New Delhi are also very humid and hot. In contrast to this, Pinsky set a winter day in Beijing as the fourth dome with slightly lower levels of pollution but much lower temperature and humidity. Pollution there stems mostly from coal fire plants outside the city, domestic wood fires for heating and transportation. Last, São Paulo exemplifies a location with a hot and dry climate, as well as pollution that numbs the senses. These originate from cheap ethanol, which is used as fuel for vehicles and transportation. Overall, the locations were chosen to make the difference in air pollution as distinct and the experience of the PPs as immersive as possible.

Since the obvious topic of the PPs was air pollution, and climate change was to be read between the lines, measures and experimental conditions were always realised in two ways – for air pollution and climate change (see section 3.3.3 below). However, past research supports the idea that air pollution and climate change may be linked in the mind of the public. Swim, Geiger, Fraser and Pletcher (2017) explored educational programs for raising awareness about climate change and found that concerns about air pollution were heightened alongside the intended topic, even though air pollution was not mentioned in the programs. The effect seems to also occur the other way around – Whitmarsh (2008) found that when people experienced air pollution personally, it also significantly influenced their perception and behavioural reaction to climate change. A study by Hart and Feldman (2018) even found that framing climate change

²³ In the beginning, when the installation was created, Pinsky wanted the first dome to represent the location of the exhibition, which was Trondheim. Later, when the PPs toured to other locations, he renamed the first dome Tautra to represent a location with very clear air. Tautra is an island about 80km north of Trondheim, with fresher air than Trondheim, which suffers in winter from air pollution due to heating through fireplaces and abrasion of car tires with spikes on tarmac.

²⁴ When the exhibition visits more polluted locations, then this dome is cleaned with specific filters.

mitigation policies as a matter of air pollution is more effective than for climate change. Thus, it could be assumed that climate change and air pollution are considerably related to each other and the experience of the PPs was therefore assumed to highlight both environmental problems.

Other considerations by the Climart team were made before deciding to use the PP installation. These included the decisions that it was unreasonable to add gases such as carbon dioxide and methane to the PPs, which are primary contributors of climate change, because participants would not be able to smell them. In favour of the PPs was also the assumption that the experience of conditions around the world and the physical connections among the domes emphasizes global interconnectedness. This was seen as important because the goal was to trigger visitors' pro-environmental intentions and behaviour through an increase in awareness of consequences of their own behaviour and ascription of responsibility (Bamberg & Schmidt, 2003; DeGroot & Steg, 2009).

3.3.2. Data collection procedure

Data collection took place twice, first in Trondheim, Norway, as part of the "Starmus Festival – Life and the Universe" (<https://www.starmus.com/starmus-iv/>) and second in London, United Kingdom, at a solo exhibition by Pinsky (<https://www.somersethouse.org.uk/whats-on/michael-pinsky-pollution-pods>). In Trondheim, the surveys took place during three weeks across June and July 2017, beyond the period of Starmus Festival. The installation was accessible every day for eight hours in a public park, approximately 15 minutes walk from the centre of Trondheim. The goal was to choose a venue which was frequented by all types of citizens. At the second location in London, the arts venue Somerset House was situated in the centre of the city. The PPs were exhibited for one week in April of 2018 and data was collected during this whole week. At both venues, the research assistants were asked to address the visitors in a uniform way. The exact formulation can be found in Study 4 in the Appendix.

There was no random selection of participants; every visitor was asked to partake in the study. However, participation was voluntary and not a precondition to be able to enter the PPs.²⁵ The direction in which the visitors walked through the circle of pods was always the same, so spectators experienced the polluted cities in the same order. Most visitors did not come alone but together with their partners, friends and family, naturally talking about their experience. In the case of London, the number of visitors per dome was restricted to five, to guarantee the best experience for everyone and avoid overcrowding. When filling out the questionnaire, the participants were asked to do this by themselves and not to confer with their company. Visiting times varied between spectators but took on average 10 minutes.

Comparison group. To be able to conduct a quasi-experiment on the effects of the PPs on behaviours, data was also collected from one comparison group at each location. Measures of intentions and behaviour from the comparison group allowed us to set a baseline for intentions and behaviours in a population that had not chosen to visit the artwork. Moreover, the data from the comparison groups provided information about the socio-demographics of the sample of the study, which then could be used as control variables in the following regression analyses.

²⁵ We did not collect data on how many visitors agreed to participate in the study, in retrospect, this might have been interesting. My subjective impression is, that in Trondheim about 90% of the visitors participated, while in London it was maybe 75%.

In Trondheim, data for the comparison group was collected during three days of a food and folk festival in the city centre. The festival attracts people from all parts of society and from the whole region. The visitors were approached by two research assistants asking them whether they were willing to fill out a questionnaire. It was important that participants in this group had not seen the PPs – therefore, everyone who did was not included in the comparison group survey. In London, data collection for the comparison group took place in other parts of Somerset House, among visitors who had not seen the PPs. Participants of the comparison group were then excluded from data collection at the PPs if they wanted to see the installation later.

3.3.3. Measures

Behaviour measure – Dependent variable. Since the goal of this study was to create engagement with climate change, pro-environmental behaviour was measured after visiting the PPs. In Trondheim, participants were asked to register on the online platform ‘Ducky’²⁶. There they could calculate their carbon footprint and find suggested pro-environmental behaviours to implement in their daily routine. Registering on the platform was counted as behaviour measure, with each behaviour logged providing information about the action chosen by respondents, as well as the overall amount of CO₂ saved per participant. To match the answers on the questionnaire with the behaviour of logging onto the platform, whilst still guaranteeing anonymity, participants were provided with a log-on code that matched the code on their questionnaire.

Pro-environmental intentions measure – Dependent variable. Intentions were measured with two items; intentions to act on climate change and intentions to act on air pollution. These were formulated in a more general way as “I intend to do something actively to prevent climate change/environmental problems in the future”. These two questions were asked twice, once before entering and once after exiting the PPs and responses could be given on a 7-point Likert scale from 1 (“strongly disagree”) to 7 (“strongly agree”). All other questions were only asked after exiting the pods, as response to the installation.

Questionnaire – Independent variables. The emotions were measured the same way as in Studies 1 and 2, this time however including *shame*, *pride* and *helplessness* and excluding *apathy*.

Cognitive concepts of reflections and contemplations on the PPs and meaning-making (as well as awareness of consequences, ascription of responsibility and relevance for daily lives, which were discussed in the introduction (Table 2)) were included in Study 4. Examples for items representing the constructs “reflection and contemplation on the artwork” were: “The artwork made me think about environmental problems”, “the artwork made me think and reflect on its meaning”. Examples for measures of awareness of consequences were “the artwork highlights environmental problems that would affect me personally” and “the effects of environmental problems on public health are worse than we realize”. Ascription of responsibility was measured using items such as: “I feel partly responsible for the environmental problems on our planet”. Some of these items were already used in Studies 1 and 2, and some new ones were adapted from De Groot and Steg (2009) to fit the context of the PPs. The items were measured with a 7-point Likert scale ranging from 1 (“strongly disagree”) to 7 (“strongly agree”).

²⁶ <https://www.ducky.eco/en/>

Furthermore, the concept of systems thinking was included in the questionnaire to see how participants responded to the aspects of an interconnected world highlighted by the PPs. For this, a version of the systems thinking scale by Lezak and Thibodeau (2016) was used, with items modified to fit the context of art and the environment (e.g., “I gained a stronger sense of the connection between my actions and the well-being of people in other places” and “this artwork made me think about living conditions for animals and plants”).

Covariates. The same socio-demographics as in the previous studies were included as control variables. Additionally, items to measure chronic lung diseases, and knowledge about climate change were expected to be related to the dependent variables independent of the exposure to environmental art and therefore also included as covariates. I assumed that participants with a history of chronic lung diseases would show a stronger reaction to the installation, because the PPs highlight the topic of air pollution. As a proxy for chronic lung diseases, participants were asked to report the personal “relevance of ease of breathing”: “Is ease of breathing an important topic for you or your family?” on a 7-point Likert scale 1 (not at all), 7 (very much).

Moreover, studies have shown that knowledge on climate change is associated with more concern around the topic (Swim & Geiger, 2017). It was therefore expected that people with more knowledge about climate change were more likely to attend the PPs. Knowledge was measured using four selected items of a knowledge scale by Simon, Volmert, Bunten and Kendall-Taylor (2014). The items chosen specifically focused on climate change (e.g., instead of ocean acidification connected to climate change). For example, the question “Why is the climate system changing?”. The responses were offered in multiple-choice format with four options and one correct answer. Accordingly, knowledge scores ranged from zero to four total correct answers.

All Likert-scaled items ranging from 1 to 7 were recoded for the analysis to -3 (strongly disagree) to +3 (strongly agree) and to 0 (not at all) and 6 (very much), to make the resulting mean values easier to interpret.

Comparison group. Participants in the comparison group filled out a shortened questionnaire, including measures for intentions to act on climate change and air pollution, socio-demographics and cognitive measures. Pro-environmental behaviour was only measured in Trondheim.

3.3.4. Sample

The overall sample of Study 4 consisted of four groups – the PPs group in Trondheim (N = 1016) and in London (N = 851) as well as the comparison groups at both venues (Trondheim: N = 415; London: N = 380). To make the sample sizes for the preliminary analysis comparable, the two comparison groups were merged into one group, after checking for their comparability. The aim of the study was to identify differences between the PPs and comparison group and not differences between participants in Trondheim and London. Therefore, ANOVAs were conducted, testing for differences between the PPs and comparison groups.

Table 1 of Study 4 shows the mean values of socio-demographics per group, as well as the results of the ANOVAs testing for differences in socio-demographics. With a mean age of $M = 38.8$, the participants in the comparison group were oldest (Trondheim PPs: $M = 32.66$, London PPs: $M = 35.57$), with the highest concern about ease of breathing $M = 2.59$ (Trondheim PPs: $M = 2.41$, London PPs: $M = 2.31$) and the lowest baseline intentions $M = 2.33$ (Trondheim PPs: $M = 2.52$,

London PPs: $M = 2.73$). The group with the least art experience at the PPs was found in Trondheim with a mean of $M = 2.32$ in comparison to visitors at Somerset House ($M = 1.93$, CG: $M = 2.12$, inversed scale), with the comparison group ranging between the two, most likely because it also included participants at Somerset House, only not at the PPs. Knowledge about climate change was nearly the same among all three groups (CG: $M = 3.34$, Trondheim PPs: $M = 3.31$, London PPs: $M = 3.34$). The education levels were significantly different, according to chi-square tests conducted for the categorical variables, education and gender, with participants being most educated in London (for details see section 3.1 Participants in Study 4). For gender, no significant difference in the distribution of both male and female participants between groups was found.

3.3.5. Statistical approach

Multiple Imputation. Before any statistical analysis was conducted, the data was checked for missing values, which showed 5% of answers were missing. Therefore, the data was imputed using the Expectation-Maximization Method (EM), ensuring more unbiased results, through more retained information using simple imputation (Schafer & Graham, 2002). A detailed description of the imputation process is given in Study 4.

Principal Component Analysis. Since most of the above measures had been adjusted to the context of the study and not been used this way before, a principle component analysis (PCA) was conducted to reduce the number of variables. Thereby, meaningful components rooted in the theory from the introduction were created. The PCA was run using oblique rotation and a cut off point for cross-factor loadings of higher than .30.

The PCA revealed the following components: Negative emotions consisted of 1) moral emotions of *guilt and shame*, 2) negative feeling of uncertainty *anxiety*, and 3) *sadness, helplessness and anger*. Positive emotions also contained three components: uplifting feelings (*awe, inspiration and surprise*), a single uncertainty emotion (*hope*), and feelings of *happiness and pride*. The cognitive variables resulted in a total of four components, 1) “general reactions and reflections on the artwork and global systems”, 2) “awareness of consequences”, 3) “ascription of responsibility”, and 4) “relevance for daily life”. Details on the PCA and the resulting components can be found in Study 4.

Regression Analysis. These components were then used for regression analyses, together with the covariates described above. Their results will be presented together with the other results next.

4. Results

4.1. Study 1 – Characterization of effective environmental artworks

The first paper, “Does Activist Art Have the Capacity to Raise Awareness in Audiences? – A Study on Climate Change Art at the ArtCOP21 Event in Paris” was published in the Journal of Psychology of Aesthetics, Creativity and the Arts in July 2019. It focuses on the diverse range of artworks exhibited at the ArtCOP21 and answers the research questions on how these pieces of art affect their spectators on an emotional and cognitive level.

To analyse participant responses statistically, a cluster analysis (see section 3.1.5) and several ANOVAs were conducted. As input variables for the cluster analysis, the mean values of the emotional responses to each piece of art included in the study were calculated across respondents for each piece of art. Based on these mean values, the pieces were clustered using the Ward’s method. The cluster analysis resulted in four clusters, which were called “the comforting utopia”, “the challenging dystopia”, “the mediocre mythology” and “the awesome solution” according to the psychological profile and identified commonalities. Figures 1-4 in Study 1 show examples of art in the four clusters.

In the next step, the resulting clusters were associated with the cognitive reaction visitors showed. Thereby patterns of the psychological reactions of participants could be identified and the emotional and cognitive reactions between clusters compared with each other (see Figure 10 and 11). It should be kept in mind, that the comparison of the emotional and cognitive reactions between clusters were relative to each other and not an absolute value for the potential reactions the art in the cluster could trigger. To test which differences between clusters were significant, ANOVAs for every emotion and cognition were conducted (see in Study 1 Table 3 and post-hoc tests in Table 4).

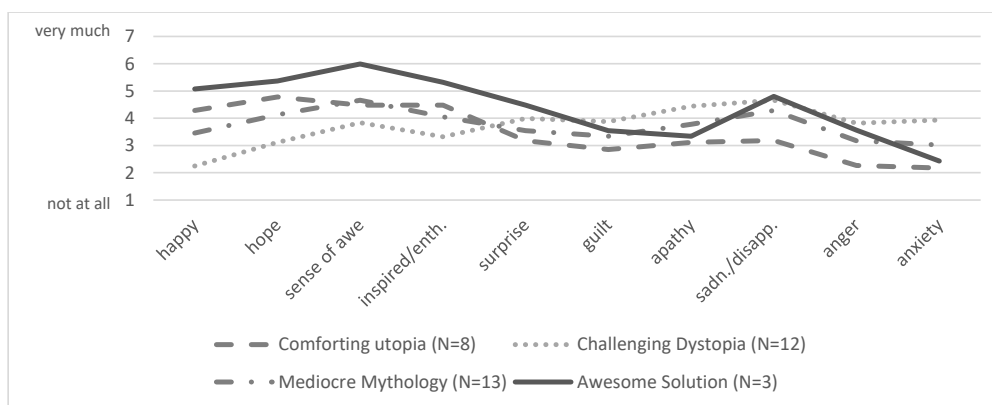


Figure 9 Mean answers of participants per cluster for positive and negative emotions as reaction to the artworks comprising Cluster 1 to 4. N = Number of artworks per Cluster.

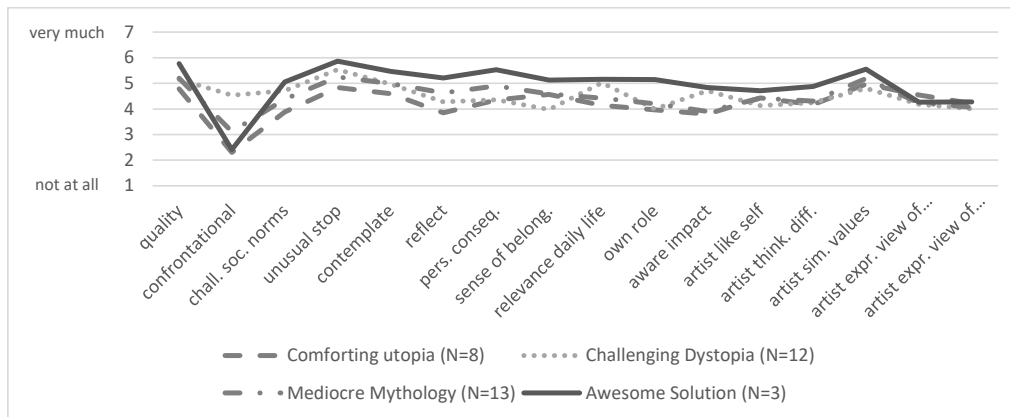


Figure 10 Mean answers of participants per cluster for cognitive variables as reaction to the artworks comprising Cluster 1 to 4. N = Number of artworks per Cluster.

Last, the pieces of art in each cluster were studied for similarities in features based on the list of artwork characteristics collected by us (see section 3.1.2). This was to identify formal aspects of art that had the potential to trigger a certain psychological reaction in people, and therefore be associated with pro-environmental engagement. The goal was to derive guidelines for artists and climate change campaigners with the aim of increasing the impact of their work on people.

4.1.1. The four clusters and associated emotions and cognitions

The first cluster - “the comforting utopia” – was associated with the weakest negative emotions of all clusters, slightly stronger positive emotions and relatively weak environmental cognitions (see Figure 10 and 11). In comparison to the other three clusters, the art in this cluster made participants feel the least guilt, apathy, sadness/disappointment, anger and anxiety. Positive emotions were slightly stronger, coming between the highest and lowest scoring clusters, showing people felt relatively happy, hopeful and inspired. Moreover, “the comforting utopia” was perceived to contain art with the lowest quality out of all the clusters. Regarding the environmentally relevant cognitive variables, the artworks in this cluster were rated lowest on the level of confrontation, their level of reflections, and awareness of the impact of climate change. With respect to how participants perceived the artist, the artworks in “the comforting utopia” were rated very similarly as “the challenging dystopia” and “the mediocre mythology”, but participants felt slightly more that the artist was expressing the view of the public.

In the second cluster – “the challenging dystopia” – participants reacted with the strongest negative and weakest positive emotions in comparison to the other clusters. The emotional pattern seemed to be nearly inverse to the emotional pattern associated with “the comforting utopia”, apart from that the positive emotions connected with “the comforting utopia” were not the strongest among the clusters. The emotions participants in “the challenging dystopia” experienced least were happiness, hope, sense of awe, inspiration/enthusiasm, whilst surprise, guilt, apathy, sadness/disappointment, anger and anxiety were experienced most. The quality of the artwork was rated third (M = 5.15, SD = 1.36), but close to “the mediocre mythology” (M = 5.20, SD = 1.30). Regarding environmentally relevant cognitions, the artwork in this cluster were perceived to be the most confrontational and shocking in comparison to the

other clusters. Moreover, “the challenging dystopia” scored second highest for challenging social norms - the artwork has something unusual that made me stop, awareness of impact and relevance for daily life. With respect to the level of identification with the artist, “the challenging dystopia” scored among the lowest of all four clusters.

The third cluster - “the mediocre mythology” - was associated with emotional and cognitive reactions that were neither especially strong nor weak. Because the psychological reactions were average, the patterns for this cluster are described in less detail. The strongest emotions participants reported for this cluster were a sense of awe, as well as sadness/disappointment. Also, the perceived quality of the artwork was rated about the same as for “the challenging dystopia”. With respect to other cognitions, relatively strong reactions were found for “the artwork had something unusual that made me stop”, “showing personal consequences of climate change” and “the artist is similar to me”.

The fourth and last cluster- “the awesome solution” – presented the strongest emotional reactions for all positive emotions, with weaker (but not the weakest) negative emotions, apart from “sadness and disappointment”, which was rated strong again. Also, the quality of the artwork was perceived to be the highest of all four clusters. Regarding environmentally relevant cognitive variables, this last cluster was associated with the strongest thoughts for all variables apart from “the artwork is confrontational and shocking”, “the artist expresses the view of the public” and “of a minority”.

The ANOVAs (or in the case of a violation of the homogeneity of variances, Welch test’s) testing for differences between clusters, showed that all emotional variables had significantly different mean scores between clusters. These results validated that all emotional variables were relevant for defining the clusters. On the other hand, the differences between clusters for the cognitive variables, held implications for what can be learned from the differences between clusters and the features that define them. For the significantly different ANOVAs, post-hoc tests were calculated to define between which clusters the differences lay. The detailed differences between groups are not presented here but can be found in Table 4 of Study 1 (with four clusters and 17 variables a description of all results would be too extensive to describe here). The interpretation of the results is presented in the discussion of Study 4, and extensively in the discussion of this dissertation (see section 5).

4.1.2. Characteristics of Artworks

In search for commonalities among the artwork comprising the clusters, it was decided that a characteristic of a piece of art defines the whole cluster, if at least three pieces per cluster had this feature. The list of artwork characteristics described in section 3.1.2., reported whether the artwork in question was, for example, an installation or a painting, the material it consisted off and so forth. In the case of “the awesome solution” an exception was made; two pieces per cluster were considered sufficient, because this specific cluster consisted of only three pieces of art.

The following attributes were found to define the four clusters: “The comforting utopia” contained elements of participation by the audience, playfulness, colour and topics of dreams, and visions of a utopian future. Additionally, the works were mostly exhibited in non-art locations. “The challenging dystopia” on the other hand, was characterized by pieces of art that illustrated technical or artificial objects and painted a dystopian picture of the future. Artwork in this cluster was also dark in colour, often using metal, showing destruction, social oppression and/or death, although being mostly exhibited in an art setting. Artwork in “the mediocre mythology” illustrated interconnectedness of

ecosystems and beings, showing the world as a whole, as well as drawing on mythological themes to tell a story. Additionally, typical for art in this cluster was colourfulness, with mixed materials and mostly exhibited in an art setting. The last cluster, “the awesome solution” contained as mentioned beforehand, only three pieces. These were characterized by making cause and effect of human behaviour visible and showing solutions. Also, artwork in this cluster was colourful, depicting sublime nature and mostly exhibited outside. The conclusions that were drawn from the features of the artwork in the four clusters and the psychological reactions associated will be discussed in section 5 below.

4.2. Study 2 – Results on the identification of mechanisms of environmental art perception

The second article “And once more with feeling – What role does visual art play in motivating people to support climate policy?” is currently to be submitted. It moves the focus from the artworks exhibited at the ArtCOP21, their characteristics and the effect they had on spectators, to the mechanisms within the spectators. Thereby, it aims to answer the question how can a piece of art lead to motivation to support climate policies, and how is this motivation dependent on the features within the art?

The analysis involved two steps. First, a structural model based on theory from the introduction was tested (person-level model), including the relations between emotions, environmentally related cognitive constructs and the dependent behaviour variable and the level of support for climate policy. Second, an interaction hypothesis was tested between environmental attitudes, reflections on the artwork and policy support. This was done to check whether the effect of reflections on the artwork were the same for people with weak initial environmental attitudes, compared to people with strong initial environmental attitudes. This was relevant, because the results of the person-level model showed that people with weaker environmental attitudes were affected more. It is therefore possible that people who were not very convinced about the environmental problem beforehand, were affected more by the artwork. Third, the artwork-level model including the influence of artwork characteristics on the psychological reactions of participants was calculated.

4.2.1. Person-level model of the art experience

Taken from the article, Figure 12 represents the findings of the person-level model. The indices for the fit of the model show a good fit with $\chi^2=463.69$, $df=133$, $p<.001$, $\chi^2/df=3.49$; $RMSEA=.054$ [.049 .060]; $CFI=.96$; $TLI=.95$; $SRMR=.049$.

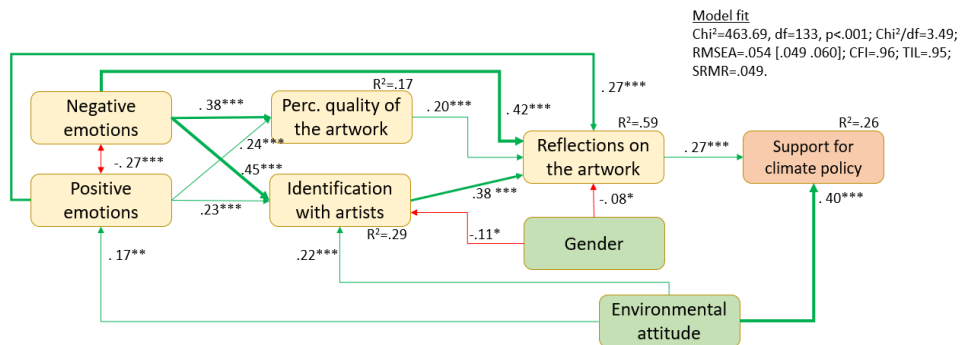


Figure 11 Structural equation model of the art experience at ArtCOP21 and its influence on climate policy support (N=839).

The model demonstrates in which way the experience of the environmental artwork was processed. First, participants showed both negative and positive emotions as reactions to the artwork. These emotional reactions were both positively associated with mediating cognitions, “perceived quality of the artwork”, “identification with the artist” and “reflections on the artwork”. Negative emotions had a stronger impact on all three cognitive factors than positive emotions, indicated by the larger regression coefficients. This means that the people who reported more negative emotions, but also positive emotions, reported stronger cognitions. Next, participants’ cognitions “perceived quality of the artwork” and even more “identification with the artist” were positively associated with the “reflections on the artwork”, thereby indicating that people who perceived the art to be of high quality and who felt a connection with the artist were more likely to make an effort and reflect on the art. Last, reflections on the artwork were then positively associated with “support for climate policies”, thereby showing, that the more the participants reflected on the artwork, the more they were willing to support climate policies.

Socio-demographics were included as covariates in the model. Only gender and environmental attitudes showed a significant influence: relative to men, women reflected more on the artwork and identified more with the artist. Environmental attitudes were a strong predictor of climate policy support, but also influenced to which degree the participant identified with the artist and how much they felt positive emotions.

4.2.2. Interaction between reflections on the artwork, environmental attitudes and climate policy support

The influence of environmental attitudes on support for climate policies discovered in the person-level model, brought up the following additional hypothesis: Reflections on the artwork might have a stronger impact on the dependent variable support for climate policies, for participants with strong initial environmental attitudes. To test for this interaction, support for climate policies was regressed on environmental attitudes, the “reflections on the artwork” and the interaction between both variables. Results showed a negative interaction between “reflections on the artwork” and environmental attitudes. This meant that “reflections on the artwork” exhibited a stronger effect on support for climate policies for people with lower environmental attitudes than for those with higher attitudes.

4.2.3. Artwork-level model – differing mechanisms among artworks

To investigate whether different artworks were systematically associated with certain reactions in spectators, the artwork-characteristics were added as within person-level variables. The variance of the artwork-level was modelled for the following variables measured for each of the pieces of art: negative and positive emotions, “perceived quality of the artwork”, “identification with the artist” and “reflections on the artwork”. To reduce model complexity for the subsequent analyses, a simpler model was defined on the person level. In this model only the person-level model variables were included and correlated with each other. Next, all artwork features that led to the emotional and cognitive reactions listed beforehand were tested in a stepwise procedure. Figure 12 (same as Figure 4 in Study 2) shows the result of this approach.

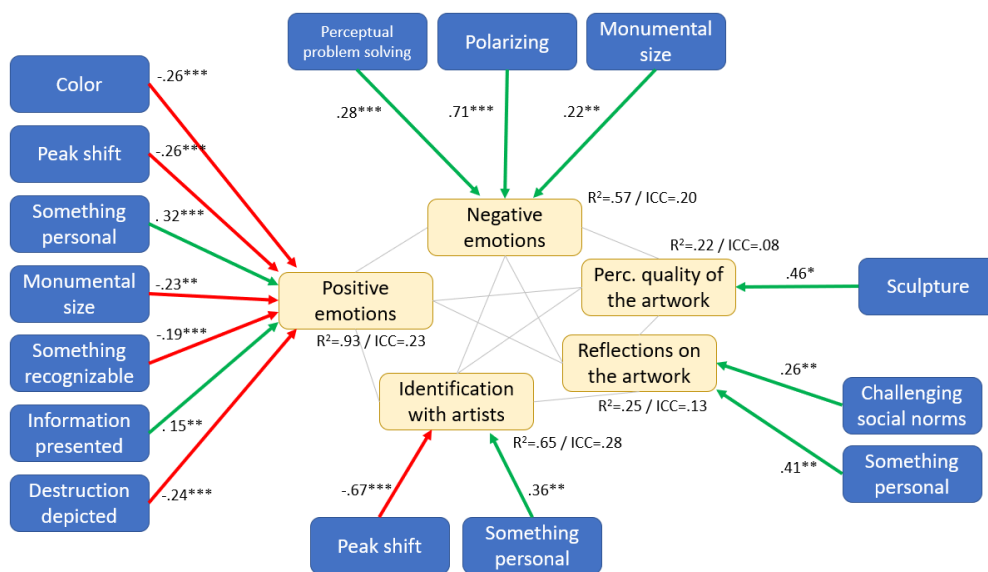


Figure 12 Artwork level part of the multilevel model with variance in emotional responses, identification with the artist, perceived quality of the artwork, and reflection on the artwork modelled on the artwork level ($N_{level1}=720$, $N_{level2}=37$).

The figure demonstrates that on the artwork-level, the biggest variation among the different pieces of art, could be found in predicting the positive and negative emotional reactions, and “identification with the artist”. The Intra Class Correlations (ICC), explained 28% of the variance through identification with the artist, 20% through negative and 23% through positive emotions on the artwork level. This meant that there was sufficient variability between pieces of art on these variables to account for meaningful results. In comparison, “reflections on the artwork” and “perceived quality of the artwork” show considerably lower ICC values, indicating less variation on these constructs between pieces.

Adding the artwork characteristics at the artwork-level, the variance among pieces of art for each emotional and cognitive response could be explained by several, but different, features of the art. The features explaining the variance for positive emotions the spectators experienced, were black or dark (vs. colourful) and big or monumental artworks. If the artwork had such features, positive emotions were reduced. The same is true for art making use of the “peak shift principle” (see footnote 1) and showing a known object or destruction. Opposite to that, associated with an increase in positive emotions, was art that was presented with accompanying information or that showed “something personal”.

Variation in negative emotions explained by the artwork characteristic was, again, related to the size of the artwork, with bigger pieces showing an increase of negative emotions. Stronger negative emotions were associated with more “polarizing” pieces, and if it led to “perceptual problem solving”.

For the cognitive reactions to the artwork, fewer associations with features of artwork could be found. The “quality of the artwork” was perceived to be higher for sculptures in comparison to other types of artwork, while “reflections on the artwork” was associated with art that included a “personal aspect” to identify with and which “challenged social norms”. Last, the “identification with the artist” was reduced if the artwork made use of the “peak shift principle” and increased, if “something personal” was present in the artwork.

4.3. Study 3 – Results of the study on the effect of contextualizing information on the perception of environmental art

The third article “Contextualizing Information Enhances the Experience of Environmental Art” was published in January 2019 in the *Journal Psychology of Aesthetics, Creativity, and the Arts*. It followed up on findings from Studies 1 and 2, investigating the effect of context in the form of information on the experience of environmental art. The statistical analysis contained two steps. First, differences between the information and no-information group were tested on dependent variables derived from questionnaire and eye-tracking measures. In the case that assumptions for parametric tests were violated, Wilcoxon rank-sum tests as non-parametric versions were calculated. In a second step, a mediation analysis was conducted to investigate whether meaning mediated the association between the presentation of information and the art experience. To do so, four-step mediation testing (Baron & Kenny, 1986; Tofighi, 2020) was applied.

4.3.1. Comparison of experimental groups

Included in the tests for differences between information groups, were the measures for the aesthetic experiences: liking, interest, meaning and emotions. Results showed that these four measures were all stronger in the information condition than the no-information condition (for median values of test results and details, please refer to Study 3 in the results section). However, the results for the eye-tracking measures were not so clear. The group comparisons showed only one significant difference, for the measure average duration fixation, which was significantly quicker for the information condition. There were no significant differences by information condition for viewing time, the number of fixations and visual attention for the semantic region. There were also no significant differences between information conditions on pro-environmental intentions compared to behaviour.

4.3.2. Mediation analysis

Testing for mediation, a mediation could be found, revealing support for meaning-making as a mediator of the effect of giving information on liking, interest and negative emotions. When controlling for meaning, the direct effect between giving additional information when showing an artwork on liking, interest and emotions was significantly decreased. More detailed information on the mediation analysis can be found under section “Mediation effects” in Study 3.

4.4. Study 4 – Results on the association between emotions, environmental cognitions, intentions and behaviour in reaction to the “Pollution Pods”

The last study within this dissertation was called “‘Pollution Pods’ – The merging of art and psychology to engage the public in climate change” and was published in the journal *Global Environmental Change* in November 2019. It investigated the associations between emotions, cognitions and pro-environmental intentions associated with the visit of this art installation.

4.4.1. Differences in samples

The sample consisted of several subgroups, the PPs group in Trondheim, the PPs group in London and a comparison group that did not experience the PPs (comparison groups from both Trondheim and London were merged to make sample sizes between groups comparable; see also section 3.3.4.). To test for group differences in socio-demographics, several ANOVAs were conducted (see Table 1 in Study 4). Results indicated that the visitors at the PPs both in Trondheim and London were significantly younger than the ones in the comparison group (medium effect size). The PPs groups also had stronger pro-environmental baseline intentions (small effect size) and experienced more “ease of breathing” (see section 3.3.3 for a description of this variable) than participants in the comparison group (very small effect size).

Comparing the visitors of the PPs at the two locations with each other, it was found that participants in London had stronger pro-environmental intentions, more experience with art, and were older than in Trondheim (small effect sizes for intentions and age; medium effects size for experience). The difference in art experience was not surprising, given that the location of the exhibition in London was Somerset House - one of the top art venues in Europe.

Among the socio-demographics collected were two categorical variables: gender and education, for which chi-square tests were computed. The detailed results can be found in Study 4. It is worth highlighting here the nearly even distribution of gender between the groups (PPs vs. comparison group and London vs. Trondheim). Regarding the level of education, significant differences between London and Trondheim with large effect size were found. Most visitors in London held a university degree (79%), while in Trondheim, education was much more stratified. Detailed results on the distribution of educational levels can be found in Study 4. All socio-demographics were included as covariates in the following analyses and the difference in baseline intentions (small effect size) is addressed in the discussion.

4.4.2. Effect of Pollution Pods on pro-environmental behaviour

Hypothesis one (H1) in Study 4 assumed that pro-environmental behaviours would be triggered by the PPs and participants at the artwork would show more environmental behaviour than their counterparts in the comparison group. In Trondheim, all participants received a log-on code to the online platform “Ducky” (see section 3.3.3.) and were asked to calculate their carbon footprint as well as log their actions to reduce their carbon emissions. The participation rate was very low, with N = 24 participants at the PPs (2%) and N = 4 at the comparison group (0%). To compare these groups regarding their level of participation a Chi² test was calculated, which did not result in a significant difference between groups (Chi²=3.00; df=1; p=.08). Given the extremely low participation rate, the validity of the measure had to be questioned and the measure was not applied again in London. Also, the behaviour the few participants had registered on the platform, was not statistically analysed.

4.4.3. Effect of Pollution Pods on pro-environmental intentions

Hypothesis two (H2) in Study 4 predicted higher “intentions to act” in visitors of the PPs than in the comparison group, as well as higher intentions after the visit of the PPs than before. To test for differences before vs after for both air-pollution and climate change intentions (see section 3.3.3), a 2 (Topic: pollution vs. climate change) × 2 (Time: Pre vs. Post) repeated measures, including both variables, ANOVA was conducted. Results showed that both climate change and air pollution intentions increased after the PPs experience. However, this pre-post effect was stronger for climate change, since the initial intentions for climate change were lower than the ones for air pollution (see detailed results in Section 3.3 of Study 4). The pro-environmental intentions for the two topics were also highly correlated $r(2217) = 0.89$, $p < .01$, and increases in both intention measures were found, justifying merging them into one intention measure. For this single measure, an independent t-test was conducted, also pointing towards an increase from before PPs to after intentions. The effect size for the test showed a very small effect, providing relatively weak support for H2.

The significant difference between PPs and comparison group on pro-environmental intentions, with small effect size, was already reported in the description of the sample. The contrast between the intentions of the comparison group and the PPs after-group was not calculated, because the PPs groups’ initial intentions were already found to be significantly higher than that of the comparison group (also see Table 1, Study 4).

Effect of emotional and cognitive variables on changes in intentions. Hypothesis three (H3) and Hypothesis four (H4) stated that an emotional as well as cognitive activation through the PPs was positively associated with changes in intentions in participants. Therefore, a difference score between intentions before and after the visit of the PPs was calculated, with higher numbers indicating that the intentions before were stronger than after. Next, this difference score was regressed onto the emotional and cognitive reactions to the artwork, derived from the PCA described in section 3.3.5. The regression models exposed whether visitors’ emotional and cognitive reactions were associated with a change in intentions, as predicted by H3 and H4. The baseline intentions were added to all regression models, to control for a possible ceiling effect.

Because of differences between groups on socio-demographic measures and the possibility that group differences would be associated with outcome measures, socio-demographics were included as covariates in the regression models (age, education, experience with art, intentions, see above section 4.4.1). Location was added to explain possible differences between the psychological reactions of people from Trondheim and London, which were not captured by the other covariates. Before doing so, interactions between the location and all variables were calculated, with the results failing to reach significance (more information on this can be found in Study 4, section 3.3.1).

Four regression models were calculated to identify predictors of changes in intentions. The first model functioned as base model and only included the dependent variable and covariates. The second model extended the base model with emotion predictors and the third model with cognitive predictors. The fourth model incorporated all variables. Testing for emotions and cognitions separately had the advantage to investigate the effect of each group of variables, as well as the relative strength of each variable.

In all models, the baseline intention was negatively associated with changes in intentions, with the strongest standardized coefficient. Correspondingly, participants with strong prior intentions showed less increase from pre-to

post experiences in intentions. Results of the first model showed that all socio-demographics significantly affected changes in intentions, apart from knowledge about climate change. If the participant was male, had less art experience and was older, chances were reduced, that they changed their intentions. On the other hand, if the participant was concerned about “ease of breathing”, located in London or more educated, the chance for a change in intentions was increased.

Adding the emotional variables in model two only marginally reduced the beta-coefficients of socio-demographics. Looking at the emotions alone, the strongest positive association with changes in intention was shown by the factor “sadness, helplessness and anger”, followed by “sense of awe, inspiration and surprise” and then “guilt and shame”. A significant negative association was found for “happiness and pride”.

The third model, combining the base model with cognitive variables, exposed a negative effect on changes in intentions for age, but a positive effect for education. All four cognitive factors, “general reaction and reflections on the artwork and global systems”, “awareness of consequences”, “ascription of responsibility” and “relevance for daily life” displayed a significant effect on intentions, with “ascription of responsibility” being strongest.

Model four resulted in the same effects on changes in intentions for age and education. For the emotional factors, only “sadness, helplessness and anger” retained a positive effect on intentions, whereas the cognitive factors all remained significant correlates of changes in intentions, with similar beta-coefficients as those found in the third model. Additionally, all four models showed an overall significant F-value, supporting the assumption that the added independent variables improve the model fit. An indication for the improvement of the model fit was given by the adjusted R^2 values, which increased more with the additional cognitive (14%) than the emotional factors (3%) from 18% in the baseline model. The fourth model, including emotional and cognitive components showed no more increase than with the cognitive variables alone.

5. Discussion

Awareness that climate change has both a physical and a cultural reality and meaning (Hulme, 2009, p.32) and, therefore, needs to be addressed in a multidisciplinary way, has grown in academia (Moser, 2016) as well as by funding bodies (European Commission Horizon 2020). The goal of this dissertation was to harness the catalytic and societal impacts of the arts and to assess their ability to communicate the urgency of climate change. This dissertation carried out a multidisciplinary approach, incorporating environmental art with theory and methods from art perception and environmental psychology. More specifically, this dissertation and the four resulting articles accrued information from environmental art, collaborations with artists, and presented an investigation into the *psychological* mechanisms underlying *environmental art* perception with potential implications *for climate change communication*. The goals of this dissertation were as follows: 1) To investigate whether environmental art could be used as a tool for climate change information campaigns and action. 2) To inform artists and other creative practitioners on how to construct impactful environmental art. 3) To investigate how the arts and environmental psychology could be integrated to further climate change education and action.

Each article focussed on different aspects of experiencing environmental art, to reach the three goals described above. In Study 1 psychologically impactful environment art was characterized by four distinct patterns of emotional reaction to the art. It included artwork with many different styles, to form as basis for the analysis, pairing the four emotional reaction patterns with spectators' thoughts on and physical features of the artwork. Study 2, based on the same data, highlighted the emotional and cognitive mechanisms within the spectators that ultimately influenced their support for climate change policies. Following the findings from the previous studies, that found the informational context of environmental art is relevant for spectators' art experience, Study 3 examined the effect of contextualizing information on spectators' perception of environmental art. Finally, Study 4 assessed emotional and cognitive reactions visitors reported to the installation "Pollution Pods", and the effects of these reactions on pro-environmental intentions and behaviour.

This discussion will connect the results of all four studies by discussing the emotional and cognitive reactions. The clusters defined in Study 1 serve as framework, together with the features that characterize the artwork in each cluster. The aim is to look beyond the results of one study and relate to the theory presented in the introduction.

5.1. Emotional and cognitive reactions to artworks as found in "the comforting utopia"

The first of four clusters derived from participants emotional reactions to a variety of different types of artwork, called "the comforting utopia", contained art that generated relatively strong positive emotions and the weakest negative emotions. This cluster was associated with weak cognitions that were conceptualized as reflections and meaning-

making. The art was characterized as colourful, playful, participatory, depicting a “utopian future” and exhibited in non-art locations.

It appeared that participants who experienced art from this cluster reacted with positive feelings and a sense of what a positive future could look like, but the process of meaning-making seemed superficial or different from what was measured. This might not be surprising given that bright, colourful art in comparison to dark coloured art was found to be associated with positive emotions in children (Boyatzis & Varghese, 1994) and adults (Kumarasamy, Devi Apayee & Subramaniam, 2014; Sartori, Culibrk, Yan & Sebe, 2015). It was however surprising that these pieces of art were related to such weak cognitive reactions, since participatory art was found to be helpful in creating engagement with environmental topics and behaviour (Giannachi, 2012; Curtis et al., 2014; Chandler, Baldwin & Marks, 2014). Given the trend in environmental art to explore playful and sensory ways of visualizing natural science data (Jacobs, Benford, Selby, Golembewski, Price, & Giannachi, 2013), it is especially important to find an explanation for this.

One hypothesis is, that participants in “the comforting utopia” experienced the uplifting effect and the positive emotions associated with making art that is used in art therapy (Dalebroux, Goldstein & Winner, 2008; De Petrillo & Winner, 2005). Together with the topic of “utopian futures”, the process of being creative may have led spectators of participatory artwork to focus on their personal wishes for the future and climate change, instead of engaging with the personal responsibility that was measured in the questionnaire of Study 1. Theory on utopianism supports the connection between “utopian futures” and personal wishes. According to Bardzell (2018) utopian cognitions include forward oriented thinking, anticipations of what could be, and intentions for the future. These are very different cognitive processes than anticipated in the model of environmental art perception as part of this dissertation, which include reflections on one’s own behaviour and responsibility. This conceptual gap could explain why the measured reactions to the cognitive variables in Study 1 were so low – because the process of creating art with a utopian scenario lead to different cognitions than anticipated and measured by us.

The element of participation was found in studies on climate change communication to be especially suited for creating future scenarios and engagement on a community level. In public deliberation processes attempts are made to generate citizen engagement, with workshops or focus groups with local stakeholders (Pidgeon et al., 2014; Campos et al., 2016). Such participatory workshops have proven quite successful and can include visualization of different adaptation scenarios (Sheppard et al., 2011) also in the form of 3D Visualization (Schroth, Angel, Sheppard & Dulic, 2014). Taking environmental artists on board in such a workshop could provide another form of visualization and form of engagement. Especially, if the goal is not to make citizens understand the implications of different modelled climate change scenarios, but to develop utopian ideas of how people want to live together in their local community. The effects of such a project driven by a utopian artist would need to be investigated in future research.

Generally, we can learn from art in “the comforting utopia” that, dependent on the form of interaction of the audience with the artwork (e.g. participation), different emotions and cognitions come into play. This is supported by findings from Study 2, where the artwork-level model shows that participatory and utopian artwork like in “the comforting utopia” were not associated with cognitions incorporated in the model, however, the aspect of “colour” was associated with an increase of positive emotions.

Research on colour and emotion tells us that blue-green, green-yellow and green are most arousing, while yellow-red and purple-blue were least arousing (Valdez & Mehrabian, 1994). The colours blue and green, in the form of landscapes paintings and natural scenery were associated with positive emotional responses and a state of calm (Lankston, Cusack, Fremantle, & Isles, 2010). In the context of surrounding colour and physical exercise, the colour green was associated with lower mood disturbance and less physical stress, while the colour red led to feelings of anger (Akers et al., 2012). However, emotional reactions are very content-specific and dependent on not just the colour, but also hue and lighting (Valdez & Mehrabian, 1994; Jalil, Yunus & Said, 2012). Artists, who intend to create a certain emotion in their spectators, are recommended to take research on the psychological effect of colour on emotions and mood into consideration.

Extending this analysis of physical features to the PPs, they did not have a clear colour palette, given that the plastic inlays of the domes were transparent, and the artwork mostly adapted to the colour of its surroundings. However, visitors reported a range of emotions which were subsequently found to be associated with changes in intentions of visitors (Study 4). Regression Model 2, only including emotions, showed that of the positive emotions, “happiness and pride” were negatively, while “sense of awe, inspiration and surprise” were positively related to changes in intentions. The effect of negative emotions will be discussed under section 5.2. because negative emotions were typical as reaction to art in “the challenging dystopia” (see Table 2, Study 4).

The results of Study 4 showed that different emotions had different effects on pro-environmental intentions. There is to my knowledge very little research in environmental psychology, apart from the study by Wang et al. (2018), that investigated the effect of a wide range of negative and positive emotions on engagement. Studies on negative emotions, such as guilt (e.g. Swim & Bloodhart, 2014; Rees, Klug, & Bamberg, 2015), fear or anxiety triggered by images of climate change (Nicholson-Cole, 2005; O’Neill & Nicholson-Cole, 2009; Corner, Webster & Teriete, 2015) outweigh studies in which positive emotions are researched. Findings from Study 4 demonstrated that the experience of environmental art can be negatively associated with feelings of “happy and pride”, thereby having an inhibiting effect on pro-environmental behavioural intentions. This is most likely because “pride” in participants’ respective countries, and “happiness” about the relatively low level of air pollution and future effects of climate change, would likely not motivate behaviour change. On the other hand, if visitors felt “a sense of awe, inspiration and surprise”, engagement followed in the form of increased pro-environmental intentions. This is consistent with a study that found awe to promote green consumption (Wang, Zhang, Shi, Lu & Song, 2019) based on the understanding that “awe” is an emotion that arises when people feel overwhelmed by a perceptual stimuli, while at the same time a need for improving their mental scheme (Keltner & Haidt, 2003). It is possible, that the PPs had an overwhelming effect on its visitors through the sensual impressions of experiencing pollution levels from around the world, whilst provoking curiosity around interconnectedness and the different conditions people in other countries live in. Connecting these assumptions with the theoretical concepts on emotions presented in the introduction (Böhm, 2003; Pfister & Böhm, 2008) it appears that “happiness” and “pride” did not create commitment to act according to the benefit of the greater good (commitment function), while the other positive emotions might have highlighted the relevance of climate change for the individual (relevance function).

To summarize, it is important in the context of environmental art to investigate individual emotions and not general measures of “negative” or “positive emotions” or “liking/disliking” as it is often done in the field of art perception. Additionally, positive emotions can facilitate or hinder engagement with climate change and should be investigated in

more detail in environmental psychological studies. Participatory art leads to positive emotions and might be best applied in participatory citizen engagement programs to create future scenarios.

5.2. Emotional and cognitive reactions to artworks as found in “the challenging dystopia”

Many psychological reactions and features of the second cluster in Study 1, “the challenging dystopia” were opposite to “the comforting utopia” in their strength and manifestation: “The challenging dystopia”, was associated with mostly negative emotions, such as strong feelings of “guilt”, “apathy”, “sadness and disappointment”, “anger” and “anxiety”. On a cognitive level, the art was perceived to be “confrontational”, but also “relevant for daily lives” and to make participants “aware of the impact of their own behaviour”. Artwork in this cluster tended to be in dark colours, with metal or artificial materials, depicting dystopian scenarios, death and destruction (see Table 5, Study 1), which is typical for contemporary environmental art (Miles, 2010; Nurmis, 2016).

The question arises whether the dark horror in these works is effective for inspiring people to act, or whether the apathy and anxiety act as barriers for climate change engagement. “Negative emotions” as seen in the person-level model in Study 2, were positively associated with “reflections on the artwork”, the “perceived quality of the artwork” and “identification with the artist” which again were positively related to “reflections on the artwork”. “Reflections on the artwork” were directly associated with “support for climate policies”. The influence of negative emotions was stronger than the one of positive emotions on all cognitive components (see Figure 2, Study 2), which could be seen as an indication that negative emotions, felt by participants when encountering the artworks of “the challenging dystopia”, are enhancing their support for climate policies rather than inhibiting.

The associations between features of artwork and the psychological mechanism of environmental art perception on the artwork-level model of Study 2 elicited several interesting connections. Environmental art that was “dark in colours” and “depicted destruction” was negatively associated with “positive emotions”. On the other hand, “polarizing” and confrontational aspects of the artwork, were positively related to “negative emotions”. Sculptures, such as “Fridge Cube”, “Le film Noir de Lampedusa” and “Unbearable”, all part of “the challenging dystopia”, were positively associated with the “perceived quality of the artwork”. Lastly, if the artwork was “challenging social norms” as was the case for works in this cluster, it was positively related to “reflections on the artwork”. Given the parallels between the features of the artworks in “the challenging dystopia” on the artwork-level and the psychological mechanism identified on the person-level model, the following could be assumed: If the artwork was dark in colours and depicting destruction, it most likely negatively influenced policy support via a decrease in positive emotions. On the other hand, if the artwork was polarizing, a sculpture and challenging social norms, it most likely lead to an increase in policy support. In any case, more features were associated with the psychological mechanism of art perception suggested in the person-level model, than for “the comforting utopia”, which indicated a higher psychological activation associated with artwork in this cluster.

Adding findings from Study 3, where only negative emotions were measured, results showed that in the information condition, where a short description of the art and artist were given, negative emotions were stronger than without information. I would therefore recommend artists and environmental campaigners working with environmental art to accompany their artwork with similar contextualizing information. This may increase the emotional reaction, attributed

meaning of the artwork and, thereby, the likelihood of environmental engagement. Future research should investigate which kind of information is most suitable for accompanying environmental art, to specifically increase (negative) emotions that lead to personal reflections and engagement. Especially, because studies on art and contextualizing information so far have focused on understanding (Leder, Carbon, & Ripsas, 2006; Millis, 2001; Swami, 2013) and meaningfulness associated with the artwork (Cupchik, Shereck, & Spiegel, 1994; Russell & Milne, 1997; Russell, 2003), but not on emotional reactions (Gerger, Leder & Kremer, 2014).

Coming back to the question, are negative emotions as reaction to the experience of environmental art inhibiting or facilitating engagement? Results from Study 4 can contribute to the answer. Regression Model 2 (Table 2, Study 4) showed that if only emotions were included, positive (“sense of awe, inspiration and surprise”) as well as negative emotional factors (“sadness, helplessness and anger”; “guilt and shame”) influenced changes in intentions. However, when the cognitive variables were added (regression Model 4), only one influential emotional factor remained: “Sadness, helplessness and anger”. Sadness and helplessness can be categorized as “consequence-based emotions”, while anger belongs to the “ethic-based emotion” (Böhm, 2003). Meaning, that the experience of artwork in “the challenging dystopia” was deemed as having negative consequences for the spectator and to be contrary to personal goals, supposedly deliberately caused by someone else (Silvia, 2009). The consequence-based emotions might have been influential in changing participants intentions to act on climate change and air pollution, because participants might have wanted to avoid the consequences of climate change and thereby the negative emotions. Anger, on the other hand, is associated with aggression and self-assertion and can be understood as emotion that motivates people to deal with whatever threatens their goals (Kuppens, Van Mechelen, Smits, & De Boeck, 2003; Berkowitz & Harmon-Jones, 2004). It seems therefore reasonable to assume that anger increases peoples’ intentions to act. Further research should investigate these three emotions in the context of environmental art and climate change engagement and action.

Taking together the findings from Studies 1 and 2 with respect to artwork in “the challenging dystopia”, it can be concluded that there were significantly more associations between artwork characteristics and psychological reactions in the models of Study 2 than for “the comforting utopia”. Therefore, I would interpret the psychological level of activation through artwork in “the challenging dystopia” to be substantially higher than in the first cluster and hence more likely to represent personal engagement with the artwork and its topic. Moreover, dystopian artwork, or in the case of the PPs, art that showed people the scary reality of air pollution and climate change, is not perceived to inhibit engagement with relevant topics. One indicator was the strength of effects of negative emotions in the person-level model of Study 2 and the influence of the emotional factor “sadness, helplessness and anger” in Study 4. As mentioned above, regarding the effect of positive emotions, environmental psychology should open its investigation on emotions as motivators for pro-environmental engagement and behaviour to positive emotions as well.

5.3. Emotional and cognitive reactions on artworks as found in “the mediocre mythology”

The artwork in “the mediocre mythology” was characterized by emotional and cognitive reactions that ranged between, but never above or below, the other three clusters. This meant that none of the psychological reactions were remarkable. The typical features of artwork in this cluster were “illustrations of interconnectedness”, “depictions of the

whole world”, “themes of mythology”, “colourfulness” and “mixed materials” whilst being mostly exhibited outside the context of galleries and museums.

Trying to relate the artwork features in “the mediocre mythology” with emotional and cognitive components in the artwork-level model of Study 2, the feature of bright colours was the only common feature. The same findings of the effect of colour on emotions applied for this cluster as was found for “the comforting utopia”. No other conclusions or psychological effects of artwork in “the mediocre mythology” could be deduced from the findings of Study 2.

The connection to findings from Study 3 or 4 were based on the positive emotions associated, again, with bright “colours” and can be found under the description of “the comforting utopia”. Generally, it can be concluded that for creating engagement with climate change or another environmental topic, it seems to be the least successful, psychologically speaking, when the artwork causes a mediocre reaction. If the artwork neither leaves people with a special sense of awe, nor makes them especially sad, angry or anxious, no noteworthy cognitive reaction follows and consequently no special motivation to act.

5.4. Emotional and cognitive reactions to artworks as found in “the awesome solution”

Opposite to the moderate emotional reactions participants showed to the “mediocre mythology” are the artwork in “the awesome solution”. Art in this fourth cluster triggered strong positive emotions, making participants feel, in comparison to all the other clusters, very “happy”, “hopeful”, “inspired and enthusiastic” and “a sense of awe”, while at the same time very “sad and disappointed”, “guilty” and “angry”. The emotions “apathy” and “anxiety” were however, not so strong (see Figure 5, Study 1). Relative to the other three clusters, the artwork in “the awesome solution” was associated with the strongest scores for all cognitive measures, apart from the “art is shocking and confrontational” and “the artist is expressing the view of the public” (see Figure 6, study 1). Typical artwork features for this cluster were “showing solutions”, “making cause and effect of human behaviour visible”, “depicting sublime nature” and again, being “colourful”. Additionally, two of the three pieces in “the awesome solution” were exhibited in a public, outdoor location.

Combining this information with the artwork characteristics and relations identified in the artwork-level model of Study 2, we can derive the following: None of the features of the artwork in this fourth cluster showed a significant association with the person-level model of Study 2. However, the fact that the artwork in this cluster led to strong scores for nearly all variables in Study 1, justifies a closer look at the three pieces of art comprising “the awesome solution”: The “Blue Whale”, an installation in the form of a life-like blue whale at the river Seine, can be described as monumental in size, which was associated in the artwork-level model with inhibiting “positive emotions” whilst increasing “negative emotions”. It might be difficult to imagine how an installation of a blue whale can trigger negative emotions in people. However, the “Blue Whale” installation was representative of the loss in biodiversity, meaning all the animal and plant species that have gone and might go extinct. Keeping this in mind, it is easy to imagine that the installation made visitors feel “sad and disappointed”, for example. Regarding the categorization as “sculpture”, which was positively associated with the “perceived quality of the artwork”, both, the “Blue Whale” and “Mur vegetale”, a wall filled with flowers made from plastic lids, could be considered as sculptures. Lastly, positively associated with “positive emotions” was the information presented together with the “Blue Whale” and the photographs of “Honey Roads” – the Blue Whale

contained in his belly information on biodiversity loss, while every photograph that was part of Honey Roads was exhibited together with information on where the picture was taken and what bee species it depicted. So, even though no obvious link between the artwork features defined in Study 1 and the mechanism of environmental art perception was apparent, several other features could be identified retrospectively, that do have an association. Therefore, I assume, that artwork like in “the awesome solution” lead to a high psychological activation.

Similar in physical scale and scope of the “Blue Whale”, the PPs could be described as a sculpture with monumental size, showing destruction, or at least dangerous pollution, and its effect on people. By choosing Trondheim as the location for the first dome and London as the second, something personal, namely the place where visitors live in, is included in the installation. Indirectly, the PPs challenged peoples’ norms, by making the connection between the consumption of people around the world and the impact this has in developing countries experienceable. The structure of the PPs themselves was not very colourful, but through the transparent tent structure, the colours of the surrounding of the PPs could be picked up and the pods therefore change colour according to the location of the exhibition.

The analysis of the PPs data showed, separately from the emotional relations outlined in the description of the other three clusters above, a connection to the cognitive reflections and meaning-making processes that I assumed to be important in the environmental art perception process. Regression Model 3 and 4 of Study 4 (see Table 2, Study 4) presented that changes in intentions participants reported after visiting the PPs, were influenced positively by “ascription of responsibility”, “general reactions and reflections on the artwork and global systems”, “awareness of consequences” and “relevance for daily lives” (in the order of magnitude). This is in alignment with earlier findings that showed “awareness of consequences” together with environmental art can be a powerful tool for communicating environmental challenges (Curtis, Reid & Reeve, 2014; Marks, 2016); as well as “ascription of responsibility” which was used to explain environmentalism (Schwartz 1977; Stern, 2000).

Looking at the significant relation of “general reactions and reflections on the artwork and global systems” with changes in intentions, this can be used as indication that environmental art indeed can create a space for reflection. In this space, the spectators are able to discover the meaning of the artwork and climate change for themselves, including thoughts on temporal aspects of climate change, interconnectedness of social- and ecosystems, and general connections between one’s carbon footprint and its environmental consequences (Lezak & Thibodeau, 2016). This result is important for two reasons: 1) barriers of engagement and psychological distance (Gifford et al., 2009; Milfont, 2010) appear to be overcome by the experience of an artwork such as the PPs. 2) The aspect of offering a personal space of reflection, is what makes environmental art different from climate change education or information campaigns. Educational efforts present climate facts, that are neither personal, nor do they leave things open for reflection. I would describe the “space of reflection”, apart from the emotional activation through the PPs, to be an important aspect that makes environmental art a great additional tool for climate change campaigners. Lastly, adding to the ability of making climate change a “personal topic”, is that the PPs seem to have been able to make people aware of the importance of climate change and air pollution for their “daily lives” (O’Neill & Nichol森-Cole, 2009).

To summarize, the positive relation between changes in intentions and the cognitive meaning-making process, suggested that environmental art should highlight aspects of personal responsibility, personal consequences of climate change and the relation to peoples’ daily lives. These findings are supported by Roosen’s (2020) dissertation and

qualitative study of the PPs. She described that participants felt a reduction of the psychological distance, through an increased awareness of the problem, an activation of personal values, and a heightened sense of responsibility.

By exposing the psychological mechanisms and showing how the environmental art experience can affect the cognitive processes in spectators, this dissertation contributes to the growing body of literature that investigates how the psychological distance to climate change can be reduced (Fraser, Pantescio, Plemons, Gupta & Rank, 2013; Jones, Hine & Marks, 2017; Swim, Geiger, Sweetland & Fraser, 2018). It seems to be pivotal, that individuals are being exposed to different forms of information on climate change that increase awareness, create a sense of responsibility and personal involvement, as well as trigger deliberate reflections about the topic (Swim, Geiger, Sweetland & Fraser, 2018) – all of which can be done through environmental art. Another aspect in favour for environmental art as a communication tool is the finding on the interaction between reflections on the artwork, environmental attitudes and support for climate policies from Study 2. Results showed that environmental art was especially impactful for spectators with lower initial environmental attitudes than for the ones with already higher attitudes. This is important, because climate change communicators usually struggle to reach people that are not already engaged, and usually end up “preaching to the choir” (Hestres, 2014; McNeal & Hammerman, 2014) even if it remains necessary to address “the choir” as well (Sloane & Wiles, 2020). Environmental artists should therefore be encouraged to come forward with engaging new works that entice the audience, while climate change communicators should include climate change art in their set of tools to reach out to the public.

5.5. Limitations

Naturally, there are theoretical and methodological limitations to the studies conducted for this dissertation. These limitations will be discussed, starting with the individual data collections, followed by aspects spanning across all four studies.

5.5.1. Limitations of Study 1 and 2

First, Studies 1 and 2 were very exploratory in their nature, since data collection took place in the beginning of the Climart project and at a festival with a high diversity of events. The ArtCOP21 featured all forms of visual environmental art, but also readings, performances and guided tours. To avoid problems with the categorization of “art” vs. “non-art”, the pieces were selected based on the categorization on the ArtCOP21 website as “visual art”. Together, with the diversity in artwork, came a wide range of settings in which the pieces of art were exhibited. On the one hand, the diversity of art, as well as locations, could be interpreted as a strength, because it demonstrated the range of environmental and climate change art that exists and therefore represented a real-life scenario.

The diversity could also be interpreted as weakness, from both the artistic and scientific side. The artistic side could criticize not using a clear definition accepted by art historians and the inclusion of creative pieces that might be too “functional”, “descriptive” or “pedagogic” to qualify as “fine art”. However, I would argue that, a comprehensive overview on the history of environmental art was given in the introduction to provide context for the artwork under investigation in this dissertation (naturally, without claiming to do this at the level of an art scholar). The presented working definition for “environmental art” was taken from Marks, Chandler & Baldwin (2017), who earlier conducted research on the impact of environmental art on its audience. Generally, the goal of this psychological dissertation was

not to judge whether a piece of environmental art qualified as art, but to investigate the psychological effect of what could generally qualify as “environmental art” for its audience. Another indication for what qualifies as art, could be, if the participants described the works as “art”. In none of the four studies did the participants fail to do this.

Secondly, the scientific side could argue that with such a big range of artwork and manner of presentations, many factors could have influenced the process of art perception that could not be controlled for. In an attempt to remedy this, I emphasised the exploratory nature of the study. The fact that the data collection took place in the field, makes the findings more applicable to other real-life scenarios. Lastly, the first two studies presented the first data collection on an extensive range of environmental artwork, thereby adding interesting new insights for art perception and environmental psychology. The statistical approach of Study 1, cluster analysis, is a method used particularly to discover natural groupings based on similarities in the data and to initiate a process of hypothesis generation (Dubes & Jain, 1980). Therefore, I would argue that it was most suitable for organizing the data and getting a first impression on how the variables and concepts from both fields related to each other in the beginning of the project.

5.5.2. Limitations Study 2

The biggest challenge in the context of a transdisciplinary study using SEM, was to specify a suitable model combining theory from both environmental psychology and art perception. Even though the literature was clear that emotions play an important role in both fields, the models in art perception do not agree on whether emotional reactions to art precede the cognitive reactions, or vice versa. Leder, Belke, Oeberst and Augustin refer in their 2004 paper to the long debate on this question in their field, which was still not solved 12 years later in Pelowski et al.’s (2016) visualization of dominant models in art perception. Given that the literature was inconclusive, it was decided to follow Locher’s (2015) and Silvia’s (2013) understanding, that places emotions before cognitions in the person-level model of Study 2. This order was chosen, because literature from emotional and evolutionary psychology suggests that emotions could function as first, immediate reaction to the artwork and a kind of “relevance detector”, while cognitions follow to give a context for the emotional arousal (Öhman, Flykt & Esteves, 2001; Grandjean & Scherer, 2008). The person-level model received a good model fit supporting the notion, that the concepts’ order was at least compatible with empirical answering patterns. However, this does not mean no other theoretical order is possible or could achieve a similar fit.

Adding to the discussion on the order of emotions and cognitions, are the results of the regression models in Study 4. The baseline model (regression Model 1, only covariates) explains 18% of variance, increasing to 21% with the emotional variables in Model 2, and to 32%, with the cognitive predictors in Model 3 (Model 4: 32%; Table 5, Study 4). There are several explanations for this effect. The bigger increase in explained variance could indicate that cognitions account for most of the effects of emotional reactions on intentions and are therefore more important in the perception process of the PPs. Alternatively, it could be a measurement issue, given that intentions are also cognitions and cognitions might therefore represent changes in intentions better than emotions.

Lastly, it is possible that the art experience triggered an emotional episode with consecutive cognitive processes, which in turn influenced the emotional reactions (Leder, Gerger, Brieber and Schwarz, 2014). Unfortunately, it was not possible with any of the data collected for this dissertation to test a model of emotional feedback loops, and I am not sure if it would be possible with other data. To be able to do so, one would need to run an EEG or neuroimaging study and measure the brain activity after exposure to the artwork, to investigate which area of the brain, associated with

emotional or cognitive reactions, would react when. Future research could examine emotional feedback loops, given it is possible with neuro-scientific methodology. Generally, more research is needed, especially in the context of environmental art, to confirm the order of emotions and cognitions in the output stage of art perception.

5.5.3. Limitations Study 3

Most likely the major limitation of Study 3, is the opposite of Study 1 and 2 – the fact that only one piece of art was investigated. As thoroughly discussed in the limitations section in Study 3, it would be good to replicate the findings of this study in further research with several other pieces, including different styles, techniques and themes, in order to support the generalizability of the findings.

In the context of the whole dissertation, a limitation was that the level of “identification with the artist” was not included in Study 3 (and neither in Study 4). Mostly because the focus of Study 3 was on the information given alongside the artwork, and not this very specific cognitive variable of how artists are being perceived. Therefore, Keller, Klöckner, Hanss and me decided to narrow down the focus of the study to the variables included.

5.5.4. Limitations Study 4

One of the biggest points of discussion around the PPs, was an argument against the installation as culmination of Climart, brought up during the idea collection process of the commission²⁷: The goal of the Climart project and its artist commission was to engage individuals with the topic of climate change, not air pollution. Several studies show that air pollution and climate change are connected in peoples’ mind (Whitmarsh, 2008; Swim et al. 2017; Hart & Feldman, 2018). Drawing on these studies the whole Climart team discussed whether the double-sided topic of the PPs would cause a problem for the psychological research. We concluded that the PPs should be created, but that the experimental set-up should reflect that there could be a divide between air pollution and climate change. To do so, measures and experimental conditions were always implemented for both topics (see section 3.3 and 4.4 above).

As in Study 3, only one piece of art was investigated in Study 4, which reduced the generalizability of findings to other artwork. However, given that the PPs had many visitors (around 30 000 visitors²⁸) and was shown in multiple locations, it would have been very difficult to find even one, let alone more, comparable pieces that had a similar outreach.

Moreover, we cannot be sure that the artwork specifically created the emotions and thoughts measured in Study 4. The experimental set-up only allowed to test the extent to which people felt or thought about climate change. However, these feelings and emotions were likely to change from pre- to post experience as was indicated by the findings of the previous studies.

²⁷ Pinsky had after some first meetings with the Climart team in Trondheim suggested five different possible artworks. In a workshop all of them were examined and reviewed for their advantages and disadvantages from an environmental psychological, but also artistic background. The PPs was the artwork for which most of the team felt compelled by and convinced off.

²⁸ https://capefarewell.com/images/random/Pollution_Pods_at_COP25_press_release.pdf

5.5.5. Limitations dependent measures – intentions and behaviour

Studies 3 and 4 measured environmental intentions and behaviour as dependent variables, and both measures showed measurement difficulties. Environmental intentions exhibited ceiling effects in both studies, with a median of $Md=6.00$ ²⁹ for the information and no-information group in Study 3, as well as with mean intentions before the PPs ($M=2.62$), after the Pollution Pods ($M=2.69$), and in the comparison group ($M=2.33$)³⁰. This indicates that participants generally reported strong intentions to act.

The size of effect for Study 3 was very small. Whilst the study successfully induced pro-environmental behaviour regarding participating in the lottery, 42% of participants in the no information group selected the option to donate if successful (to a green NGO vs. collecting an Amazon voucher) compared to 55% in the information condition, with no significant difference between the two groups. If the condition did have a meaningful impact on behaviour, a much larger sample would have been needed to increase statistical power and detect it. This may have been because the artwork itself encouraged people to act in a more environmentally friendly way, rendering the addition of information irrelevant. Alternatively, participants likely did not anticipate winning so their choice of answers may not have reflected their true intentions. Finally, many participants reported strong intentions for pro-environmental behaviour which could have been what led them to choose the donation over the voucher, independent of the artwork and the given information. Therefore, the use of a lottery may have been inadequate to measure behaviour change.

While the behaviour measure in Study 3 leaves open to interpretation why there was no difference between the experimental groups, the behaviour measure in Study 4 presented more substantial problems. As described in the method section, participants in Trondheim who visited the PPs or a folk festival in the city centre of Trondheim, were asked to log on to an online platform, where they could calculate their carbon footprint and their pro-environmental actions. The plan was, to compare the amount of CO₂ saved and the type of behaviours logged between the PPs and the comparison group in the city. Unexpectedly, of all participants in Trondheim (PPs: $N=1016$, CG: $N=415$) only 24 in the PP condition (2%) and 4 in the comparison group (0%) respectively, signed up to the platform. The fact that no difference could be found between the two groups signing up to the platform could mean that the behaviour was too difficult to do, and therefore failed to measure any changes in participants that did occur. Consequently, the low participation rate made it impossible to run a meaningful analysis of the few behaviours logged on the platform and our hypothesis could not be answered conclusively. It is possible that levels of participation could have been higher, if Ducky was available as an app, or if research assistants would have guided participants to log-on for the first time on site. In any case, given the problems encountered in Trondheim, the measure was not repeated in the data collections at the PPs in London.

Nonetheless, I would like to stress the importance of implementing a behaviour measure, since self-reported intentions also seem to fall short of predicting engagement and pro-environmental behaviour. The few people who took advantage of the pro-environmental behavioural opportunity in Study 4 led us to question whether the behavioural intentions reported were indicative of actual intention to take action and address climate change. Without a valid behaviour

²⁹ On a Likert-scale ranging from 1 = totally disagree to 7 = totally agree, see also section 3.2.3

³⁰ The 7-point Likert scale Study 4 was recoded to range from -3 to 3, for ease of interpretation, see also section 3.3.4

measure the interpretations and implications of the findings in environmental psychology do not represent the full and complex picture of psychological barriers and mechanisms in the context of climate change.

5.6. Summary

Taking together the findings on emotional and cognitive reactions outlined above, the following information can be summarized for environmental artists and climate change campaigners, who would like to increase the impact of their work:

- a) Consider the psychological effect you want the art to have on its audience: which emotions do you want them to feel and what thoughts do you want them to have?
- b) Emotions need to be considered individually. We cannot conclude that negative emotions are more motivating than positive emotions. They need to be seen in the context of the story you want to tell through the artwork. Generally, negative emotions can be helpful, for example, in prompting people to contemplate environmental art.
- c) It is important to leave room for the spectators of your artwork, in which they can take a step back and reflect on what the art and its topic mean for them personally. These cognitions, with which spectators assign the responsibility to themselves, helps them become aware of what it means for the system they live in and for the people they care about. This reflective process is vital and differentiates environmental art from other climate change communication tools.
- d) If you want to create a participatory artwork, place it within a community that wants to mitigate or adapt to climate change. As environmental artists, you can visualize the dreams of citizens of this community and facilitate the development of utopian scenarios that can become a reality, providing everyone is on board. If you are a government representative, looking for ways to engage your citizens in the creation of future scenarios, consider taking an artist on board to increase the level of participation and open up for utopian scenarios. This can also increase the positive feelings citizens have for the project and thereby support engagement in it.

6. Conclusion

“It [the Pollution Pods] takes the strengths of “immersive” installation art and puts them to agitational ends.”

ArtNetNews – The 100 Works of Art that defined the Decade

Since their first two exhibitions in Trondheim and London, the Pollution Pods have gone on a world-wide tour, and were exhibited at nine different locations, including Melbourne, New York and COP25 in Madrid. More than 30 000 visitors³¹ have experienced the immersive installation and more than 100 media outlets have reported on the installation, including The Guardian, Forbes, Die Zeit, BBC and the New York Times³². I would argue, even though the behaviour measures did not show any conclusive evidence for a change in individuals’ behaviour, these numbers and the international reaction to the Pollution Pods is a good representation of the impact the art installation has had on people. It shows that environmental art can be used as a tool for climate change communication, especially for people who are not that engaged previously. As well as that artists can reach an audience that is willing to reflect on what the artist is trying to express, and apply it to their own lives.

I hope that environmental artists see this dissertation as an invitation, to be inspired by the findings and do not see the implications for finding more and less potent aspects of art on spectators as limitations for their artistic process. Also, I hope that climate change campaigners, who might be looking for another way to address the topic, find the results useful and encourage them to take an artist or generally, the arts, on board and collaborate as a team.

Finally, with regards to how art and psychology can inform climate-change education and promote positive action, I would say that the Climart project, with its quantitative and qualitative studies, is a great example of the learning opportunities that arise from such a transdisciplinary collaboration. The arts are truly offering their creative capacity to generate engagement on an emotional and cultural level. Art perception provides insight into the mechanisms by which art is absorbed by the spectator, building on case studies' research of environmental art and enabling conclusions to be drawn potentially generalisable to the whole environmental art genre. Environmental psychology then makes it possible to identify which psychological reactions to the environmental artwork are essential for engaging people with the topic of climate change. Therefore, I would conclude that bringing these disciplines together has proven rewarding and that environmental psychology can function as a bridge between the disciplines. This is desperately needed in times where climate change is not just a distant threat, but very much already taking place. We should do everything in our power to mitigate climate change, before we can only adapt to it, and this project demonstrates that the inclusion of

³¹ https://capefarewell.com/images/random/Pollution_Pods_at_COP25_press_release.pdf

³² <http://www.michaelpinsky.com/reviews/>

humanities and social sciences in this process can be impactful in promoting positive engagement during the undoubtably daunting and challenging years ahead.

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Appendix

This section presents the original questionnaires and list of artwork characteristics used for data collections.

The order of questionnaires is the following:

1. Questionnaire of Study 1 and 2 – ArtCOP21 in Paris (English version)
2. Study 1 and 2 - Characteristics of artworks –ArtCOP21 in Paris (English version)
3. Questionnaire of Study 3 – Laboratory Darmstadt Germany (German version)
4. Questionnaire of Study 4 – Pollution Pods Trondheim
5. Questionnaire of Study 4 – Comparison Group Trondheim
6. Questionnaire of Study 4 – Pollution Pods London
7. Questionnaire of Study 4 – Comparison Group London

Please mark one box only per question.

8. What are your opinions about the artwork?
- | | Strongly disagree | | | | | | | Strongly agree | | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. The artwork appears to be of considerable artistic quality..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. The artwork has something unusual which made me stop and look at it in more detail | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. The artwork makes me think and reflect on its meaning..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. The artwork seems relevant to my daily life..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. The artwork highlights consequences of climate change that would affect me personally | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. The artwork gives me a sense of belonging to a group of like-minded people for whom the artwork speaks..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. The artwork is confrontational, i.e. it has a shocking or aggressive undertone | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. The artwork makes me think about the problem of climate change..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. The artwork makes me think about my own role within the current climate situation..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. The artwork makes me more aware of my behaviour's impact on the environment..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. The artwork challenges rules and social norms in our society..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. I am very emotionally touched by the artwork..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

9. To what extent does the artwork bring up each of these feelings within you? ⇒
- | | Not at all | | | | | | | Very much | | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. Happiness | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Guilt..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Hope..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Sadness, or disappointment that nothing is happening to prevent climate change | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. A sense of awe | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Apathy, or a sense of helplessness..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Inspiration, enthusiasm..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Anger..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Surprise..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Anxiety..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

10. Have you talked with anyone about the artwork?
- | | Yes | No |
|--|--------------------------|--------------------------|
| | 1 | 2 |
| 1. If you were at the event with <i>friends</i> , have you talked with them about the artwork? | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. If you were at the event with <i>family</i> , have you talked with them about the artwork?..... | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Have you talked about the artwork with anyone else, including other visitors / strangers? | <input type="checkbox"/> | <input type="checkbox"/> |
11. Have you seen any other climate related artworks in Paris in the past week? ⇒
- | | Yes | No |
|-------|--------------------------|--------------------------|
| | 1 | 2 |
| | <input type="checkbox"/> | <input type="checkbox"/> |

The following questions are about your personal views and preferences.

12. With whom do you most strongly identify?

A citizen of your local community 1 A citizen of your country....2 A citizen of the world 3

13. Our society faces many important challenges.

How important is it to you that each of these political and social issues are given a high priority? ⇨

It is rather unimportant in comparison 1 It is not that important to me 2 It is important, but not highest on the list 3 It should have the highest priority 4

- 1. Economy and employment..... 1 2 3 4
2. National security..... 1 2 3 4
3. Social security / Welfare..... 1 2 3 4
4. Health care..... 1 2 3 4
5. Education..... 1 2 3 4
6. Refugees..... 1 2 3 4
7. Energy and (natural) resources..... 1 2 3 4
8. Climate change and the environment... 1 2 3 4
9. Other (please specify: ↴)..... 1 2 3 4

Other (CAPITALS only, please) ⇨

Grid for other issues: 20 empty boxes.

14. Comparing yourself to others, how interested would you say that you are in environmental issues? ⇨

Far below average 1 2 3 4 5 6 7 About average Far above average

15. Your views on climate change and the environment:

- 1. Climate change is not real / not really happening 1 2 3 4 5 6 7
2. Climate change is purely a natural occurrence..... 1 2 3 4 5 6 7
3. Humans are causing rapid changes in the climate 1 2 3 4 5 6 7

14. Who should take action to prevent climate change and other environmental problems?

Mainly governments 1 2 3 4 5 6 7 Gov'tments and individuals Mainly individuals

5. How likely do you think it is that a climate change will occur over the next 25 years?

Not at all 1 2 3 4 5 6 7 Very likely

6. How severe do you think the effects of climate change will be over the next 25 years?

Not at all 1 2 3 4 5 6 7 Very severe

Please mark one box only per question.

16. Please rate the importance of these possible motivators for making personal changes related to the environment: ⇒

	Not at all important							Very important
	1	2	3	4	5	6	7	
1. Personal reasons - not wanting to suffer the consequences of climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Not harming future generations.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. Safe-guarding animals, nature and the earth.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. Resolving matters of inequality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. Other (please specify: ↓).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Other (CAPITALS only, please) ⇒

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

17. Which of the following statements describes your current state best with regard to the impact of your lifestyle on the environment, specifically climate change?

I have already changed my lifestyle towards a smaller climate footprint. I intend to keep it on that level or even reduce it further..... 1

I have already made specific plans about how, when and where to start with changes in my lifestyle, but I have not implemented it yet..... 2

I have the goal of changing my lifestyle, but I have not decided yet how to achieve that 3

I would like to change my lifestyle, but see no way to do that at the moment..... 4

I am happy with my current lifestyle, and have no intention of changing it 5

Further participation in this study.

18. If you would like to participate further by answering a short questionnaire about this event in about 4 to 6 weeks from now, please enter your e-mail address in the fields below. Participation is voluntary. If you would not like to receive an invitation for the follow-up, simply leave the fields blank. Your e-mail address will *only* be used to send you the questionnaire.

CAPITALS only, please.

1. First part of e-mail address (before @):

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

2. Last part of e-mail address (after @):

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Participating in the follow-up questionnaire also gives you the chance to win an item of your choice with a value of 550 euro. Please select the reward you think you would be most interested in. Your final decision can be made in the follow-up questionnaire.

19. Please select the reward you right now would be interested in receiving, if you win:
 Samsung Galaxy S6..... 1 Fairphone 2..... 2 A 550 euro donation to "Friends of the Earth"..... 3

Your comments:

Expert ratings

Title	Date
Artist	Day of data collection
Number of Artwork	Expert initials

Dimensions of the artwork

Highlighting global / local effects of climate change

Global	yes	no
Local	yes	no
Global and local	yes	no

Type of art work does the artwork entail describe with key words

Painting
drawing
image
photography
Video
Sculpture /
Architecture
Installation
Graffiti

What senses are involved?

senses	involved?	describe, with keywords
visual	0	
auditory	0	
kinesthetic	0	
olfactoric /taste	0	

Visual Dimension

Brightness of colors	dark	1	2	3	4	5	bright
Contrast	low	1	2	3	4	5	high
Focus	sharp	1	2	3	4	5	fuzzy
Transparency	low	1	2	3	4	5	high
Size	0-50 cm	51-100cm;			101-200 cm	2-10 m	larger
Color	colorful						black and white
The viewer is...	an outsider						a part of the artwork
Presence of the artist	In artwork						around artwork
Three-dimensional/flat	3D						flat/2d
Peak shift principle	yes						no
Perceptual grouping/binding	yes						no
Isolating single cue/module	yes						no
Symmetry	yes						no
(Visual) puns or metaphors	yes						no, if yes, describe in keywords
Perceptual problem solving	yes						no, if yes, describe in keywords
Movement	yes						no, if yes, rate the speed low 1 2 3 4 5 high
							if yes, is the motion regular 0 or irregular 0
Unique perspective; proportion	bird	frog			frontal	close-up	
visibility of artist	name display	picture			description		
Framed/panoramic							
Repetition / visual theme							
Size/shape of 'border' of artwork							
Shape (describe in key words)							
Where is it situated in space?							
Distance of viewer from object (meters)							

Materials used

Canvas paint wood metal cloth rope recycled materials plastic others, if yes, what?

Auditory

Pitch	low	1	2	3	4	5	high
Tempo	low	1	2	3	4	5	high
Volume	low	1	2	3	4	5	high
Rhythm	rhythmic			arythmic			
Timbre / tonality							
Melody							
Duration							

Kinesthetic

Intensity and quality of feeling	low	1	2	3	4	5	high	
Temperature	low	1	2	3	4	5	high	
Feeling: location in body	hand		face			arms	legs	torso
Texture	Smooth			rough				
Vibration (from sound)								
Humorous element(s)+type								

Other

Does the artwork involve participation or interaction with the audience? yes no
if yes, how?

Social component					
Framed/presented as art					
Polarization effect	yes	no	why/how?		
Challenging social norms	yes	no	how/which norm?		
Is the work suggesting	Taking certain actions			existing barriers	
Referring to	Cause	effect	solutions in Cl.Ch	individuals	societal structures
Context of presentation	outside		inside	art context	non-art context
Type	Fictional	still life	practical	social marketing	activism

Does the artwork challenge perception / break with our viewing habits? To which degree?

Is a title/description/explanation given?

Degree to which the artwork "tells a story" (narrative)

Uniqueness / visibility in space (does it stand out and draw your attention to it?)

Short description of the artwork / extra information:

BA_Kunst

Diese Umfrage enthält 14 Fragen.

Teilnehmernummer

[]Teilnehmernummer: *

In dieses Feld dürfen nur Zahlen eingegeben werden.

Bitte geben Sie Ihre Antwort hier ein:

Ihre Meinung zum Kunstwerk

Bitte teilen Sie uns im folgenden Abschnitt Ihren Eindruck von dem Kunstwerk mit, das Sie gerade betrachtet haben.

[] Haben Sie das Kunstwerk heute zum ersten Mal gesehen? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- Ja
 Nein
 Ich bin mir nicht sicher.

[] Bitte geben Sie an, inwiefern Sie den folgenden Aussagen zustimmen. *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	stimme überhaupt nicht zu			teils/teils			stimme voll und ganz zu
Ich mag das Kunstwerk.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich finde das Kunstwerk interessant.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich konnte ein Gefühl dafür bekommen, was der Künstler ausdrücken wollte.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Das Kunstwerk hat für mich keine Bedeutung.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe das Gefühl, das Kunstwerk verstanden zu haben.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich konnte das Kunstwerk leicht verstehen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[] Für mich geht es in dem Kunstwerk im Großen und Ganzen um das Thema/die Themen: *

Bitte geben Sie Ihre Antwort hier ein:

[] Das Kunstwerk weckt folgende Gefühle in mir: *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	überhaupt nicht			teils/teils			sehr intensiv
Schuld	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wut	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stolz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scham	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trauer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Angst	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
nicht emotional berührt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Zu Ihrer Person

[] *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	überhaupt kein Interesse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	teils/teils	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	sehr starkes Interesse
Wie sehr interessieren Sie sich für Kunst?		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[] *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	nie	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	ab und zu	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	sehr häufig
Wie häufig setzen Sie sich mit Kunst auseinander?		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[] Wie wichtig sind für Sie die folgenden Werte als Leitprinzipien in Ihrem Leben? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Ich lehne den Wert ab.	nicht wichtig	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	wichtig	<input type="radio"/>	<input type="radio"/>	sehr wichtig	äußerst wichtig
Autorität: das Recht, zu führen oder zu bestimmen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soziale Macht: Kontrolle über andere, Dominanz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reichtum: materieller Besitz, Geld	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Einfluss: andere Menschen und auf Geschehnisse beeinflussen können	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soziale Gerechtigkeit: Ungerechtigkeiten beseitigen, sich um die Schwachen kümmern	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hilfsbereit: sich für das Wohlergehen anderer einsetzen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gleichheit: gleiche Möglichkeiten für alle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eine Welt in Frieden: frei von Kriegen und Konflikten	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Umwelt schützen: die Natur erhalten	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Verschmutzung verhindern	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die Erde respektieren: in Harmonie mit anderen Lebewesen leben	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Einheit mit der Natur: in die Natur passen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[] Inwiefern stimmen Sie den folgenden Aussagen zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	stimme überhaupt nicht zu			teils/teils			stimme voll und ganz zu
Ich habe vor, mir weitere Werke der Künstlerin anzuschauen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe vor, mich mehr mit Umweltkunst auseinanderzusetzen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe vor, mich in meinem Alltag (weiterhin) bewusst umweltfreundlich zu verhalten.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Zu Ihrer Person 2

[] Was ist Ihr Geschlecht? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- weiblich
- männlich
- anderes

[] Wie alt sind Sie? *

In dieses Feld dürfen nur Zahlen eingegeben werden.

Bitte geben Sie Ihre Antwort hier ein:

Jahre

[] Was ist Ihr höchster Bildungsabschluss? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- Hauptschulabschluss
- Realschulabschluss
- (Fach-)Abitur/(Fach-)Hochschulreife
- Berufsausbildung
- Universitäts-/Hochschulabschluss
- Promotion
- sonstiger Abschluss
- kein Abschluss

[] Haben Sie, Ihres Wissens nach, eine Sehschwäche? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- Ja
- Nein

[]Welche?

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:

Antwort war 'Ja' bei Frage '13 [eye]' (Haben Sie, Ihres Wissens nach, eine Sehschwäche?)

Bitte geben Sie Ihre Antwort hier ein:

30.10.2017

Limesurvey - BA_Kunst

Vielen Dank!

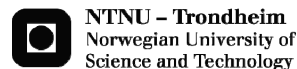
Bitte geben Sie nun Bescheid, dass Sie die Befragung beendet haben.

Übermittlung Ihres ausgefüllten Fragebogens:

Vielen Dank für die Beantwortung des Fragebogens.

CLIMART QUESTIONNAIRE

POLLUTION PODS



Thank you very much for your willingness to participate in this survey. The purpose of this study is to assess the effect of different means of communication on people's attitudes and behaviour. Your answers will be used in Research Fellow Laura Sommer's doctoral project, supervised by Professor Christian Klöckner, Department of Psychology, Norwegian University of Science and Technology.

Participation is voluntary, and all participants are anonymous.

READ THIS BEFORE YOU START.	The form will be read electronically. Please follow these guidelines: <ul style="list-style-type: none">• Use black or blue ballpoint pen. Do not write outside the boxes. Mark the boxes like this: <input checked="" type="checkbox"/>• If you make a mistake, shade in the whole box and then put a cross in the correct box.• Please mark one box only per question.
------------------------------------	--

A. Background information

1. Your gender: Female ₁ Male..... ₂ 2. Your age (years):

3. What is your nationality? *CAPITALS ONLY, please.*
Norwegian .. ₁

Other ₂ ⇒

4. What is your highest completed education? ⇒ Primary school diploma .. ₁ College or technical degree ... ₃
High school diploma ₂ University degree ₄

5. Your experience with art: ⇒
I am an art lover, and go to exhibitions regularly ₁
I like art, but I am not an art connoisseur..... ₂
Sometimes I like art and sometimes I don't – it depends..... ₃
I don't really like art, but there are some exceptions..... ₄
I really dislike art and anything artistic ₅

Please mark one box only per question.

B. To what extent does the artwork bring up each of these feelings within you? ⇒

	Not at all	1	2	3	4	5	6	Very much
	1	2	3	4	5	6	7	
1. Happiness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Guilt.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Hope	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Sadness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. A sense of awe.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Helplessness.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Inspiration.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Anger	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Surprise.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Anxiety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Shame.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Pride.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I feel unaffected.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C. To what extent does the following describe your experience with this artwork?

	Not at all	1	2	3	4	5	6	Very much
	1	2	3	4	5	6	7	
1. The artwork made me think about the problem of air quality in cities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. This artwork helped me understand the importance that people have to work together to make the world a more liveable place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The artwork made me think about living conditions for animals and plants.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. This artwork helped me see how actions we do today can have profound consequences for future generations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. The artwork made me think about environmental problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I gained a stronger sense of the connection between my actions and the well-being of people in other places.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. This artwork made me think about the importance of long term planning for the health of people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. The artwork is confrontational, i.e. has a shocking or aggressive undertone.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please mark one box only per question.

- | | Strongly disagree | | | | | Strongly agree | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. I gained a stronger sense of the connection between my actions and the health of the environment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. The artwork made me think and reflect on its meaning | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. The artwork made me think about the problem of climate change | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. This artwork helped me see how actions can have profound unintended consequences for future generations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. The artwork made me think about life in developing countries | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. The artwork made me more aware of my behavior's impact on the environment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. This artwork made me think about the importance of long term planning for the health of the planet | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. I gained a strong sense of the consequences of the health of the environment on my health and well-being | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

D. To what extent do you agree with the following statements?

- | | Strongly disagree | | | | | Strongly agree | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. Every citizen must take responsibility for the environment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Environmental problems generated in one country harm people all over the world | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. The artwork seems relevant to my daily life | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Ease of breathing is an important topic for me or my family | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. I feel partly responsible for the environmental problems on our planet | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. The effects of environmental problems on public health are worse than we realize | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Over the next several decades, thousands of species will become extinct | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. I feel that the main responsibility to take care of environmental problems lies with those that are affected by them | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. I feel that it is my responsibility to do something to prevent climate change and other environmental problems | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. The artwork highlights environmental problems that would affect me personally | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. The topic of the artwork seems relevant to my daily life | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. The balance in nature is delicate and easily upset | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Please mark one box only per question.

13. How concerned are you about the potential impact of environmental problems?

Dis-
missive
1 Doubt-
ful
2 Dis-
engaged
3 Cauti-
ous
4 Con-
cerned
5 Alarmed
6

14. How concerned are you about the potential consequences of climate change in particular?

15. Why is the climate system changing? ⇔
Emissions from burning fossil fuels are damaging the oceans. 1
Pollution dumped in the water is harming the oceans 2
The climate system is in a natural cycle of change..... 3
The climate system is not changing..... 4
Don't know 5

NOTE: Mark one answer only – select the one you think is most correct.

16. Which of the following would you say is the main problem with rising levels of CO₂ in the atmosphere? ⇔
It can damage people's lungs 1
It makes the air less clear 2
It traps heat in the earth's atmosphere 3
There is no problem with rising levels of CO₂ in the atmosphere... 4
Don't know 5

NOTE: Mark one answer only – select the one you think is most correct.

17. What affects the climate system? ⇔
The weather..... 1
The atmosphere, the oceans, and the land 2
Only natural causes such as volcanoes and sunspots 3
It is difficult to affect the climate..... 4
Don't know 5

NOTE: Mark one answer only – select the one you think is most correct.

18. How are air pollution and climate change linked? ⇔
Air pollution is one of the consequences of climate change 1
One of the reasons for climate change is increased air pollution... 2
Both are at least partly caused by increased emission of different pollutants 3
There is no connection between climate change and air pollution.. 4
Don't know 5

NOTE: Mark one answer only – select the one you think is most correct.

19. I intend to do something actively to help prevent environmental problems (continuously) in the future

Strongly disagree
1 2 3 4 5 6 7
Strongly agree

20. I intend to do something actively to help prevent climate change (continuously) in the future.....

Thank you for your answers.

Please mark one box only per question.

9. I feel that it is my responsibility to do something to prevent climate change and other environmental problems
10. The artwork highlights environmental problems that would affect me personally...
11. The topic of the artwork seems relevant to my daily life
12. The balance in nature is delicate and easily upset

13. How concerned are you about the potential impact of environmental problems?
14. How concerned are you about the potential consequences of climate change in particular?

15. Why is the climate system changing? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- Emissions from burning fossil fuels are damaging the oceans. 1
- Pollution dumped in the water is harming the oceans 2
- The climate system is in a natural cycle of change 3
- The climate system is not changing 4
- Don't know 5

16. Which of the following would you say is the main problem with rising levels of CO₂ in the atmosphere? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- It can damage people's lungs 1
- It makes the air less clear 2
- It traps heat in the earth's atmosphere 3
- There is no problem with rising levels of CO₂ in the atmosphere... 4
- Don't know 5

17. What affects the climate system? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- The weather 1
- The atmosphere, the oceans, and the land 2
- Only natural causes such as volcanoes and sunspots 3
- It is difficult to affect the climate 4
- Don't know 5

18. How are air pollution and climate change linked? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- Air pollution is one of the consequences of climate change 1
- One of the reasons for climate change is increased air pollution... 2
- Both are at least partly caused by increased emission of different pollutants 3
- There is no connection between climate change and air pollution.. 4
- Don't know 5

19. I intend to do something actively to help prevent environmental problems (continuously) in the future
20. I intend to do something actively to help prevent climate change (continuously) in the future

CLIMART QUESTIONNAIRE POLLUTION PODS

Respondent's initials

Thank you very much for your willingness to participate in this survey. The purpose of this study is to assess the effect of different means of communication on people's attitudes and behaviour. Your answers will be used in Research Fellow Laura Sommer's doctoral project, supervised by Professor Christian Klöckner, Department of Psychology, Norwegian University of Science and Technology.

Participation is voluntary, and all participants are anonymous.



NTNU – Trondheim
Norwegian University of
Science and Technology

READ THIS BEFORE YOU START.	<p>The form will be read electronically. Please follow these guidelines:</p> <ul style="list-style-type: none"> • Use black or blue ballpoint pen. Do not write outside the boxes. Mark the boxes like this: <input checked="" type="checkbox"/> • If you make a mistake, shade in the whole box and then put a cross in the correct box. • Please mark one box only per question.
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A. Initial questions

Please answer the next two questions *before* you enter the artwork. Then hand the questionnaire back to the researchers, who will make sure that you receive your questionnaire back again when you exit, to answer the rest of the questions.

	Strongly disagree	Strongly agree
1. I intend to do something actively to help prevent environmental problems (continuously) in the future	1 2 3 4 5 6 7	
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
2. I intend to do something actively to help prevent climate change (continuously) in the future.....		
	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

B. Background information

1. Your gender: Female ₁ Male..... ₂ 2. Your age (years):

3. What is your nationality? CAPITALS ONLY, please.

British ₁

Other ₂ ⇨

4. What is your highest completed education? ⇨ Primary school diploma .. ₁ College or technical degree ... ₃
High school diploma ₂ University degree ₄

5. Your experience with art: ⇨

I am an art lover, and go to exhibitions regularly ₁
I like art, but I am not an art connoisseur..... ₂
Sometimes I like art and sometimes I don't – it depends..... ₃
I don't really like art, but there are some exceptions..... ₄
I really dislike art and anything artistic ₅



KS-18
8-2

This survey is conducted with assistance from SU-fac, NTNU

E	EN	1
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Before you continue, please check that you have not forgotten anything on this page.



Please mark one box only per question.

C. To what extent does the artwork bring up each of these feelings within you? ⇨

	Not at all							Very much
	1	2	3	4	5	6	7	
1. Happiness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Guilt.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. Hope	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. Sadness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. A sense of awe.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Helplessness.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7. Inspiration.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Anger	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9. Surprise.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10. Anxiety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
11. Shame.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12. Pride.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13. Disgust	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14. Confusion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15. I feel unaffected.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

D. To what extent does the following describe your experience with this artwork?

	Not at all							Very much
	1	2	3	4	5	6	7	
1. The artwork made me think about the problem of air quality in cities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. This artwork helped me understand the importance that people have to work together to make the world a more liveable place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. The artwork made me think about living conditions for animals and plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. This artwork helped me see how actions we do today can have profound consequences for future generations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. The artwork made me think about environmental problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. I gained a stronger sense of the connection between my actions and the well-being of people in other places.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7. This artwork made me think about the importance of long term planning for the health of people	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. The artwork is confrontational, i.e. has a shocking or aggressive undertone.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Please mark one box only per question.

- | | Strongly disagree | | | | | Strongly agree | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. I gained a stronger sense of the connection between my actions and the health of the environment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. The artwork made me think and reflect on its meaning | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. The artwork made me think about the problem of climate change | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. This artwork helped me see how actions can have profound unintended consequences for future generations | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. The artwork made me think about life in developing countries | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. The artwork made me more aware of my behavior's impact on the environment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. This artwork made me think about the importance of long term planning for the health of the planet | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. I gained a strong sense of the consequences of the health of the environment on my health and well-being | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

E. To what extent do you agree with the following statements?

- | | Strongly disagree | | | | | Strongly agree | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. Every citizen must take responsibility for the environment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Environmental problems generated in one country harm people all over the world | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. The artwork seems relevant to my daily life | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Ease of breathing is an important topic for me or my family | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. I feel partly responsible for the environmental problems on our planet | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. The effects of environmental problems on public health are worse than we realize | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Over the next several decades, thousands of species will become extinct | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. I feel that the main responsibility to take care of environmental problems lies with those that are affected by them | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. I feel that it is my responsibility to do something to prevent climate change and other environmental problems | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. The artwork highlights environmental problems that would affect me personally | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. The topic of the artwork seems relevant to my daily life | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. The balance in nature is delicate and easily upset | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Please mark one box only per question.

- | | Strongly disagree | | | | | Strongly agree |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | |
| 13. We are approaching the limit of the number of people the earth can support | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. Humans have the right to modify the natural environment to suit their needs | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. If things continue on their present course, we will soon experience a major ecological catastrophe..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. Humans were meant to rule over the rest of nature..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. When humans interfere with nature it often produces disastrous consequences | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. Plants and animals have as much right as humans to exist | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. The earth has plenty of natural resources if we just learn how to develop them | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. Humans are severely abusing the environment..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21. The earth is like a spaceship with very limited room and resources | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 22. The so-called "ecological crisis" facing humankind has been greatly exaggerated..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23. The balance of nature is strong enough to cope with the impacts of modern industrial nations . | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

24. Why is the climate system changing? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- | | | |
|---|--------------------------|---|
| Emissions from burning fossil fuels are damaging the oceans . | <input type="checkbox"/> | 1 |
| Pollution dumped in the water is harming the oceans | <input type="checkbox"/> | 2 |
| The climate system is in a natural cycle of change..... | <input type="checkbox"/> | 3 |
| The climate system is not changing | <input type="checkbox"/> | 4 |
| Don't know | <input type="checkbox"/> | 5 |

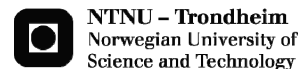
25. Which of the following would you say is the main problem with rising levels of CO₂ in the atmosphere? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- | | | |
|--|--------------------------|---|
| It can damage people's lungs | <input type="checkbox"/> | 1 |
| It makes the air less clear | <input type="checkbox"/> | 2 |
| It traps heat in the earth's atmosphere | <input type="checkbox"/> | 3 |
| There is no problem with rising levels of CO ₂ in the atmosphere... | <input type="checkbox"/> | 4 |
| Don't know | <input type="checkbox"/> | 5 |

26. What affects the climate system? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- | | | |
|--|--------------------------|---|
| The weather..... | <input type="checkbox"/> | 1 |
| The atmosphere, the oceans, and the land | <input type="checkbox"/> | 2 |
| Only natural causes such as volcanoes and sunspots | <input type="checkbox"/> | 3 |
| It is difficult to affect the climate | <input type="checkbox"/> | 4 |
| Don't know | <input type="checkbox"/> | 5 |

27. How are air pollution and climate change linked? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- | | | |
|---|--------------------------|---|
| Air pollution is one of the consequences of climate change | <input type="checkbox"/> | 1 |
| One of the reasons for climate change is increased air pollution... | <input type="checkbox"/> | 2 |
| Both are at least partly caused by increased emission of different pollutants | <input type="checkbox"/> | 3 |
| There is no connection between climate change and air pollution.. | <input type="checkbox"/> | 4 |
| Don't know | <input type="checkbox"/> | 5 |

- | | Strongly disagree | | | | | | Strongly agree |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 28. I intend to do something actively to help prevent environmental problems (continuously) in the future | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 29. I intend to do something actively to help prevent climate change (continuously) in the future..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

CLIMART QUESTIONNAIRE



Thank you very much for your willingness to participate in this survey. The purpose of this study is to assess the effect of different means of communication on people's attitudes and behaviour. Your answers will be used in Research Fellow Laura Sommer's doctoral project, supervised by Professor Christian Klöckner, Department of Psychology, Norwegian University of Science and Technology.

Participation is voluntary, and all participants are anonymous.

READ THIS BEFORE YOU START.	The form will be read electronically. Please follow these guidelines: <ul style="list-style-type: none"> • Use black or blue ballpoint pen. Do not write outside the boxes. Mark the boxes like this: <input checked="" type="checkbox"/>. • If you make a mistake, shade in the whole box and then put a cross in the correct box. • Please mark one box only per question.
--	---

A. Background information

1. Your gender: Female ... ₁ Male..... ₂ 2. Your age (years):
3. What is your nationality? *CAPITALS ONLY, please.*
 British ₁

 Other ₂ ⇒
4. What is your highest completed education? ⇒ Primary school diploma .. ₁ College or technical degree ... ₃
 High school diploma ₂ University degree ₄
5. Your experience with art: ⇒ I am an art lover, and go to exhibitions regularly ₁
 I like art, but I am not an art connoisseur ₂
 Sometimes I like art and sometimes I don't – it depends ₃
 I don't really like art, but there are some exceptions ₄
 I really dislike art and anything artistic ₅

B. To what extent do you agree with the following statements?

- | | <i>Strongly disagree</i> | | | | | | <i>Strongly agree</i> |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. Every citizen must take responsibility for the environment | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Environmental problems generated in one country harm people all over the world ... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Ease of breathing is an important topic for me or my family | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. I feel partly responsible for the environmental problems on our planet..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. The effects of environmental problems on public health are worse than we realize... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Over the next several decades, thousands of species will become extinct | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. I feel that the main responsibility to take care of environmental problems lies with those that are affected by them | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. I feel that it is my responsibility to do something to prevent climate change and other environmental problems | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Please mark one box only per question.

- | | Strongly disagree | | | | | Strongly agree |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | |
| 9. We are approaching the limit of the number of people the earth can support | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Humans have the right to modify the natural environment to suit their needs | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. If things continue on their present course, we will soon experience a major ecological catastrophe..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. The balance of nature is very delicate and easily upset | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. Humans were meant to rule over the rest of nature..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. When humans interfere with nature it often produces disastrous consequences | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. Plants and animals have as much right as humans to exist | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. The earth has plenty of natural resources if we just learn how to develop them | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. Humans are severely abusing the environment..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. The earth is like a spaceship with very limited room and resources | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 29. The so-called "ecological crisis" facing humankind has been greatly exaggerated..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. The balance of nature is strong enough to cope with the impacts of modern industrial nations . | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

21. Why is the climate system changing? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- | | | |
|---|--------------------------|---|
| Emissions from burning fossil fuels are damaging the oceans . | <input type="checkbox"/> | 1 |
| Pollution dumped in the water is harming the oceans | <input type="checkbox"/> | 2 |
| The climate system is in a natural cycle of change | <input type="checkbox"/> | 3 |
| The climate system is not changing..... | <input type="checkbox"/> | 4 |
| Don't know | <input type="checkbox"/> | 5 |

22. Which of the following would you say is the main problem with rising levels of CO₂ in the atmosphere? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- | | | |
|--|--------------------------|---|
| It can damage people's lungs | <input type="checkbox"/> | 1 |
| It makes the air less clear | <input type="checkbox"/> | 2 |
| It traps heat in the earth's atmosphere | <input type="checkbox"/> | 3 |
| There is no problem with rising levels of CO ₂ in the atmosphere... | <input type="checkbox"/> | 4 |
| Don't know | <input type="checkbox"/> | 5 |

23. What affects the climate system? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- | | | |
|--|--------------------------|---|
| The weather..... | <input type="checkbox"/> | 1 |
| The atmosphere, the oceans, and the land | <input type="checkbox"/> | 2 |
| Only natural causes such as volcanoes and sunspots | <input type="checkbox"/> | 3 |
| It is difficult to affect the climate | <input type="checkbox"/> | 4 |
| Don't know | <input type="checkbox"/> | 5 |

24. How are air pollution and climate change linked? ⇨
- NOTE: Mark one answer only – select the one you think is most correct.*
- | | | |
|---|--------------------------|---|
| Air pollution is one of the consequences of climate change | <input type="checkbox"/> | 1 |
| One of the reasons for climate change is increased air pollution... | <input type="checkbox"/> | 2 |
| Both are at least partly caused by increased emission of different pollutants | <input type="checkbox"/> | 3 |
| There is no connection between climate change and air pollution.. | <input type="checkbox"/> | 4 |
| Don't know | <input type="checkbox"/> | 5 |

- | | Strongly disagree | | | | | | Strongly agree |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25. I intend to do something actively to help prevent environmental problems (continuously) in the future | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 26. I intend to do something actively to help prevent climate change (continuously) in the future..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Papers 1-4

In this section, the papers comprising this dissertation are presented.

Paper 1

Sommer, L. K. & Klöckner, C. A. (2019). Does activist art have the capacity to raise awareness in audiences? – a study on climate change art at the ArtCOP21 event in Paris. *Journal of Psychology, Creativity & the Arts*, Advance online publication. <https://doi.org/10.1037/aca0000247>

Psychology of Aesthetics, Creativity, and the Arts

Does Activist Art Have the Capacity to Raise Awareness in Audiences?—A Study on Climate Change Art at the ArtCOP21 Event in Paris

Laura Kim Sommer and Christian Andreas Klöckner

Online First Publication, July 1, 2019. <http://dx.doi.org/10.1037/aca0000247>

CITATION

Sommer, L. K., & Klöckner, C. A. (2019, July 1). Does Activist Art Have the Capacity to Raise Awareness in Audiences?—A Study on Climate Change Art at the ArtCOP21 Event in Paris. *Psychology of Aesthetics, Creativity, and the Arts*. Advance online publication. <http://dx.doi.org/10.1037/aca0000247>

This paper is not included due to copyright

Paper 2

Klößner, C. A., & Sommer, L.K., (to be submitted). And once more with feeling – What role does visual art play in motivating people to climate action?

This paper is awaiting publication and is not included in NTNU Open

Keller, A., Sommer, L. K., Klöckner, C. A. & Hanss, D. (2018). Contextualizing Information Enhances the Experience of Art. *Psychology of the Aesthetics, Creativity and the Arts*. Advance online publication. <https://doi.org/10.1037/aca0000213>

Paper 3

Psychology of Aesthetics, Creativity, and the Arts

Contextualizing Information Enhances the Experience of Environmental Art

Anna Keller, Laura Sommer, Christian A. Klöckner, and Daniel Hanss

Online First Publication, January 7, 2019. <http://dx.doi.org/10.1037/aca0000213>

CITATION

Keller, A., Sommer, L., Klöckner, C. A., & Hanss, D. (2019, January 7). Contextualizing Information Enhances the Experience of Environmental Art. *Psychology of Aesthetics, Creativity, and the Arts*. Advance online publication. <http://dx.doi.org/10.1037/aca0000213>

This paper is not included due to copyright

Sommer, L. K., Swim, J.K., Keller, A. & Klöckner, C. A. (2019). "Pollution Pods": The merging of art and psychology to engage the public in climate change. *Global Environmental Change*, Vol. 59, 101992.

<https://doi.org/10.1016/j.gloenvcha.2019.101992>

Paper 4



Contents lists available at ScienceDirect

Global Environmental Change

journal homepage: www.elsevier.com/locate/gloenvcha

“Pollution Pods”: The merging of art and psychology to engage the public in climate change



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ARTICLE INFO

Keywords:
Emotions
Environmental psychology
Installation art
Climate change
Transdisciplinary research
Environmental awareness

ABSTRACT

Environmental artists have risen to the challenge of communicating the urgency of public action to address environmental problems such as air pollution and climate change. Joining this challenge, the immersive artwork Pollution Pods (PPs) was created through a synthesis of knowledge from the fields of environmental psychology, empirical aesthetics, and activist art. This study summarizes the scientific process in this transdisciplinary project and reports the findings from a questionnaire study ($N = 2662$) evaluating the effect of the PPs on visitors. Data were collected at the first two exhibitions of the installation, one in a public park in Trondheim, Norway, and one at Somerset House, London, UK. Intentions to act were strong and slightly increased after visiting the art installation. Individual changes in intentions were positively associated with self-reported emotions of *sadness*, *helplessness*, and *anger* and self-reported cognitive assessment their *awareness of the environmental consequences of their action*, *their willingness to take responsibility for their consequences*, and *belief in the relevance of environmental problems for daily life*. Education and age were negatively associated with intentions. Despite favorable intentions, however, taking advantage of an actual behavioral opportunity to track one's climate change emissions behavior after visiting the PPs could not be detected. We conclude that environmental art can be useful for environmental communication and give recommendations for communicators on how to best make use of it. We emphasize the potential benefits of art that encourages personal responsibility and the need for valid behavior measures in environmental psychological research.

1. Introduction

Environmental problems such as air pollution and climate change are global and urgent, and, therefore, high on the agenda of organizations such as the World Health Organization, the United Nations Environment Programme and the United Nations Framework Convention on Climate Change. The last report by the International Panel on Climate Change emphasizes that the goal of limiting global warming to 1.5 °C is still achievable - if appropriate political measures are taken now (IPCC, 2018). Involving the public is crucial to stimulate support for policy measures and to trigger individual behavior change. For example, Dietz et al. (2009) estimated that in the US approximately 20% of direct household climate change causing emissions could be reduced if the public more effectively used already available technologies. This includes citizens reducing their carbon footprints by turning down the heating in their houses and reducing the use of their private

motor vehicles (Gardner and Stern, 2008).

Environmental communication has the potential to engage the public in climate change by stimulating cognitions and emotions, thereby catalyzing individual behavior and grass root movements, as well as facilitating public acceptance of climate policies (Geiger et al., 2017; Swim et al., 2018). Several communication strategies have been tested, many of which have been informational and educational campaigns that have increased knowledge about the climate crisis as their goal. However, more knowledge about environmental problems does not necessarily translate into more pro-environment beliefs, attitudes and behavior (Steg and Vlek, 2009; Suldovsky, 2017). Therefore, alternative means of communication are being sought.

The European Commission acknowledges the importance of including the arts in addressing societal challenges by putting out a call for proposals of research projects that take a multidisciplinary approach to assess and harness the societal impact of the arts. The goal is to

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evaluate the potential of artistic research to generate solutions to current and emerging societal challenges such as climate change (European Commission Horizon 2020).

Studies have shown that art can help disseminate scientific information while facilitating engagement and activating emotions which aids communication between researchers, practitioners, and citizens (Arce-Nazario, 2016; Chandler & Baldwin, 2010; Curtis et al., 2012; Marks et al., 2016). Art has successfully been used to create engagement in group settings such as discussions (Chandler & Baldwin, 2010; Grant et al., 2015), and to stimulate both positive and negative emotions towards natural environments (Marks et al., 2016). In a comprehensive literature review, Roosen, Klöckner and Swim (2017) discuss the benefits of art in comparison to other tools of environmental communication. They explain how contemporary climate change art, such as Olafur Eliasson's and Minik Rosing's "Ice Watch" and Michael Pinsky's "Plunge", can help overcome psychological barriers and facilitate change, by, for example, disrupting routines and offering a space of reflection, or strengthening a sense of group identity among the visitors of the artwork.

In this study, we incorporate theory and findings from environmental psychology and empirical aesthetics to extend these efforts by empirically evaluating environmental art as an innovative approach to climate change communication. We do this with a piece of activist artwork that was specifically created to raise awareness and increase engagement in the topic climate change and air pollution – the "Pollution Pods" by Michael Pinsky – with the ultimate goal of creating behavioral change. Finally, we discuss the implications of our findings for environmental communicators.

1.1. The Pollution Pods

Under the umbrella of the transdisciplinary Climart project (www.climart.info), the internationally renowned environmental artist Michael Pinsky collaborated with a team of environmental psychologists. The goal of this collaboration was to meld the creative thinking and practice of the artist together with scientific findings on psychology and environmental communication on climate change into an artistic project. The result was an art installation called *Pollution Pods* (PPs). The installation consisted of five geodesic domes connected to form a ring. Within each dome, the air quality of five global locations was recreated using safe substances: Trondheim, Norway; London, UK; New Delhi, India; Beijing, China and Sao Paulo, Brazil (see Figs. 1 and 2).

Starting from Trondheim, the visitor in Norway and the UK walked through increasingly polluted pods, from dry and cold locations to hot and humid. Visitors experienced with their whole bodies, especially when inhaling, a simulation of the effects of toxic gases from domestic and industrial sources, without being actually harmed.

Pinsky's idea was that visitors would be prompted to reflect on the drivers of this pollution, which often stem from local activities, and they would make the connection between both the direct effect of harmful pollution on their health and the increasing rate of climate change (Pinsky, 2017). In his artistic practice, Pinsky draws on personal experiences from his daily life and came up with the idea of the PPs, when he was travelling from his home in London to the researchers in Trondheim. He was compelled by how fresh the air in Trondheim smelled (Pinsky, 2018). Through the representation of visitors' local environment as well as foreign environments in the PPs, the artwork was designed to both affirm personal connection to the issues as well as visitors' awareness of large scale effects of human actions on the atmosphere that translate to effects on people.

In contrast to Pinsky's focus in this work on air pollution, the goal of the commission was to engage the public in climate change and not air pollution. The team discussed the disconnect and whether it was reasonable to change the exhibit and drew upon previous studies on climate change and air pollution communication, before coming to a decision that the PPs should be implemented. It was deemed unreasonable to add gases that contribute to climate change to the pods because visitors would not be able to smell the heat trapping gas that have been the primary focus of climate change scientists and policy makers (i.e., carbon dioxide and methane). Air pollution and climate change have many common causes and the experience of walking through the PPs demonstrates the effects of these processes in different cities and countries and stresses the connectedness of global systems. Past research suggests that air pollution and climate change are linked in the public's mind. For instance, educational efforts that raise concern about climate change also appear to raise concern about air pollution, even though the latter was not mentioned in the education programming (Swim et al., 2017). Additionally, the experience of air pollution has been found to significantly influence the perception and even the behavioral response to climate change (Whitmarsh, 2008). These perceptual links between air pollution and climate change could be because carbon dioxide is often described as an air pollutant (e.g. White House, 2015). Research also points to the potential greater value of an air pollution frame than a climate change frame for engaging the

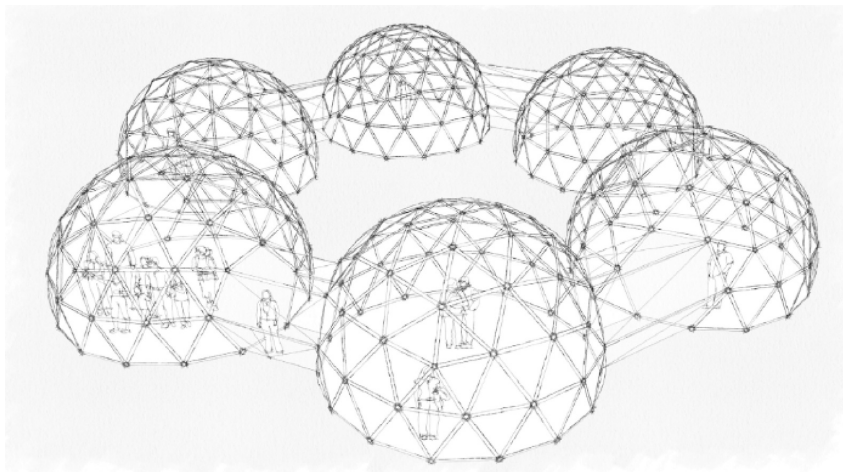


Fig. 1. Initial drawing of the Pollution Pods from above, by the courtesy of the artist Michael Pinsky.

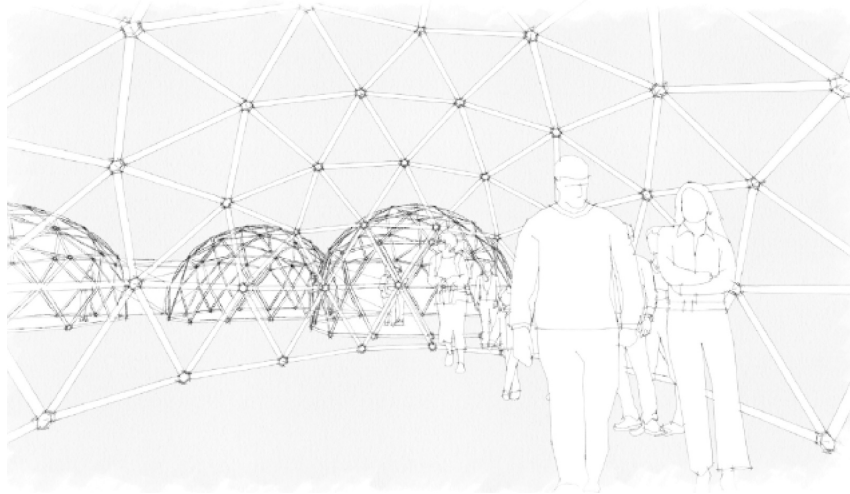


Fig. 2. Initial drawing of the Pollution Pods from inside, by the courtesy of the artist Michael Pinsky.

public. Hart and Feldman (2018) demonstrate that air pollution frames are more effective than climate change frames for garnering support for climate change mitigation policies.

1.2. Art in climate communication

Given that artwork like the Pollution Pods with a relation to climate change and other environmental topics are being created with increasing frequency and artists often aim to have an impact on their audience in the direction of increasing environmental action, it is relevant to place it within the context of other research on the use of art that focuses on climate change as a means of motivating public engagement. Curtis and colleagues were among the first to study whether art can be used as a tool for climate communication and how artworks portray environmental problems and affect public understanding (Curtis, 2009, 2010, 2011; Curtis et al., 2014). After conducting several studies on different artworks and art events, Curtis et al. (2014) concluded that environmental art can encourage pro-environmental behavior through 1) communicating information in engaging ways, 2) creating empathy towards natural spaces, and 3) including art in sustainable projects to make them more attractive and engaging for the public. Another early researcher in this area, Gabrys and Yusoff (2012) describe the contribution of art to climate communication as a space in which science and creative practices can meet, mutate and experiment. According to them, these shared encounters make reconsidering the role of politics in connection to climate change possible. Turning to participatory aspects of contemporary environmental art, Jacobs et al. (2013) wanted visitors to feel something instead of persuading them. They created an exhibit that added a temporal structure through performance and opening up spaces for spectators of the artwork to interpret for themselves. They were able to enhance feelings through enriching data with an aesthetic and sensory experience (Jacobs et al., 2013). Chandler et al. (2014) and Marks et al. (2016) emphasized in their work the educational and social aspects of art encounters. In their understanding, environmental art offers the opportunity to explore nature and to reinforce existing positive environmental values. Recently, Sommer and Klöckner (2019) conducted a cluster analysis of people's emotional reactions and reflections to a set of visual environmental artwork. They found that artwork that made causes and solutions of human behavior visible, were exhibited outside, and depicted sublime nature triggered the strongest emotional reactions

and made people reflect more than other environmental artworks that did not show such characteristics. To summarize, studies investigating the effect of environmental art on its audiences have found that there are several pathways with which art may affect people. Relevant in all of them is the space that art creates to step back and reflect, as well as to develop empathy for nature and to allow an emotional connection to grow. These findings, identified in the work of the Climart project, inspired Pinsky's creative process, when he developed the PPs and ultimately our study around it.

1.3. Factors influencing the experience of the Pollution Pods

An aim of the Climart project was not only to inform and inspire the artist behind the PPs, but also evaluate their impact. A major aim of the PPs was to increase willingness to act pro-environmentally and subsequently to promote actual pro-environmental behavior. Correspondingly, we test the effects of exposure to PPs on *pro-environmental intentions* and *pro-environmental behavior*. Based on findings from environmental and aesthetic psychology, we identified emotional and cognitive factors expected to influence changes in pro-environmental intentions. We test their association with changes in intentions to be able to assess potential mechanisms behind the effect of artworks such as the PPs. We focus on changes in intentions because it is a theoretical predictor of behaviors (Ajzen, 1991), as our design, as described in the methods and results section, does not allow us to test associations with changes in behaviors. In the following we introduce these factors and their connection to pro-environmental intentions.

1.3.1. Emotional factors

Environmental and climate change communication is loaded with emotions, from the persistent emotional reactance by climate change deniers (Moser, 2016), to the increasing sense of hopelessness and desolation among some scientists (Moser, 2016), to public feelings about collective action to address climate change with hopeful feelings being beneficial and boredom being detrimental to public engagement (Geiger et al., Fraser, under review). Emotions play a critical role in decision-making, motivating action and accepting present issues (Moser, 2016) and can be informative to the role of different emotions in changes in pro-environmental behaviors. For example, guilt and empathy can explain pro-environmental intentions and climate change mitigating behaviors (Swim & Bloodhart, 2015; Rees et al., 2015) and,

at times, fear or anxiety can block constructive engagement with climate change (O'Neill & Nicholson-Cole, 2009).

In the field of empirical aesthetics, the general importance of *emotional reactions* to the perception of art has been highlighted (Vessel et al., 2012; Pelowski et al., 2017; Silvia and Brown, 2007). The intensity of emotions is dependent on the context in which an artwork is presented, for example, a context can include or exclude embedded information (Keller et al., 2019). However, it is not clear whether there are any specific emotions central to the experience of art. In empirical aesthetics there has always been an emphasis on positive emotions (Silvia, 2007), since art experience was mostly conceptualized as a pleasant and fascinating experience (Pelowski et al., 2016). Few studies have looked beyond the pleasure of art perception, apart from for example two studies by Silvia (2007; 2009) who investigated emotions such as anger and disgust as reactions to provocative and offensive art.

The immersive experience of the PPs was designed to target a variety of emotions. The physical construction of the PPs is intended to create a pleasant visual experience. However, some smells within the pods and the associations with the environmental issues at hand are expected to trigger negative emotions as well. Therefore, measures for a range of positive (*happiness, hope, a sense of awe, inspiration*) as well as negative emotions (*guilt, sadness, helplessness, anger, anxiety, shame*) were included into the study, based on emotions that were found to be activated by environmental artworks (Sommer and Klöckner, 2019) as well as emotions that have been associated with climate change mitigating behaviors (Swim & Bloodhart, 2015). We do not test whether the PPs cause these emotions, but we anticipate that these emotions, possibly prompted by the PPs, are associated with changes in behavioral intentions. That is, given the emotions one might have in the PPs and research demonstrating associations between positive and negative emotions with pro-environmental behaviors, we anticipated that feeling these emotions would be associated with changes in intentions attributed to experiences with PPs.

1.3.2. Cognitive factors

Artists claim that environmental art provokes “different ways of seeing” (Neal, 2015, p.73), reflecting on the world we live in and our own role within it (Chandler et al., 2014). Similar indications have been made in empirical aesthetics research: In a multitude of models describing the processing and effect of art, *reflections on the artwork* are an important processing step (Chatterjee, 2004; Locher et al., 2007, 2010; Leder et al., 2004; Leder and Nadal, 2014; Silvia, 2005; Silvia and Brown, 2007; Pelowski and Akiba, 2011; Pelowski et al., 2016). Reflections often involve meaning making and self-discovery (Linguiza, Carter & Swim, 2018) and offer the possibility of self-adjustment (Leder and Nadal, 2014; Pelowski et al., 2016). Those who reflect more on the artwork and find more meaning in the artwork, may be more likely to be affected by it, for instance, by being more likely to change their personal behaviors after having experienced the PPs.

We anticipated that the tendency for systems thinking would be an important part of visitors' experiences. Systems thinking hereby refers to a holistic way of considering the world – including people and the biosphere – as being in dynamic and interconnected relationships (Randle and Stoink, 2018). The physical structure of the PPs connects the five domes, with the first or second dome being visitor's probable hometown, either Trondheim or London. The starting point links it to their personal lives. The changed experiences representing different geographic locations with different air qualities was designed to start a process of meaning making and, paired with the complexity of the immersive experience, was anticipated to encourage systems thinking. Per systems thinking: (1) the links among the pods highlight connections among geographic locations, (2) connecting one's home town in the links and personally moving across geographic locations places oneself in the system, and (3) the air pollutions caused by people links people's actions to environmental quality. Systems thinking, potentially prompted by the PPs, may encourage an individual's realization that

their own behavior can have profound implications for the health of the environment elsewhere. Thus, systems thinking, potentially prompted by the experience, may enhance changes in pro-environmental intentions that are a result of the PPs experience.

Environmental psychology has also established that *awareness of consequences, ascription of responsibility, and relevance for daily life* influence pro-environmental intentions and behavior (Bamberg and Schmidt, 2003; Stern, 2000; De Groot and Steg, 2009; O'Neill and Nicholson-Cole, 2009). Awareness of consequences reflects becoming aware of negative consequences of human action on the environment, and it is directly targeted by the PPs which explicitly aim to make the consequences of human behavior tangible. The relevance of this factor is in alignment with findings from Curtis et al. (2014) who describe art as raising awareness of the consequences of certain actions. Awareness of negative consequences might be insufficient unless the consequences are connected to one's daily life. O'Neill and Nicholson-Cole (2009) found that highlighting the *relevance for daily life* of natural and pleasant environmental conditions in a non-threatening way is pivotal for constructively engaging people with environmental problems. Another reason why awareness of negative consequences may be insufficient to prompt changes, even when they are perceived to be relevant for one's daily life, is that people may not feel responsible for the consequences (for example, because they ascribe responsibility to structures that force them to act in a certain way). It is possible that the PPs might decrease relevance for daily life and personal responsibility because visitors might believe the problematic air pollution affect the daily lives of people elsewhere and see people in other locations, not themselves as being responsible for it. However, the personal connection noted above to each geographic region could diminish psychological distance and, therefore, mitigate discounting of personal relevance and responsibility. The present study does not test changes in the *awareness of consequences, relevance for daily life, and ascription of responsibility*. It does however test and predict that those who report these cognitions are more likely to report changes in intentions as promoted by the PPs experience suggesting that they are psychological mechanisms that facilitate these changes.

1.4. Research hypotheses

According to these theoretical assumptions, we formulated the following hypotheses:

H1. Pro-environmental behavior will be stronger in a group of visitors of the PPs as compared to a comparison group who did not visit the PPs.

H2. Pro-environmental intentions will be stronger after the experience of the PPs than before and stronger than in a comparison group of people not exposed to the PPs.

H3. Emotional activation (both negative and positive emotions) will be positively associated with increased intentions to act in PPs visitors.

H4. Cognitions (those related to general reflections and meaning making, systems thinking, awareness of consequences, ascriptions of responsibility) will be positively associated with pre to post increase in the intention to act in PPs visitors.

We did not have *apriori* predictions about whether emotions versus cognitions or whether particular cognitions or emotions would have stronger relations, but instead leave these questions for exploratory analyses.

2. Method

2.1. Data collection

Data were collected on two separate occasions and locations: First, as part of the “Starmus Festival – Life and the Universe” (<https://www.starmus.com/starmus-iv/>) in Trondheim, Norway (see Fig. 3) and,

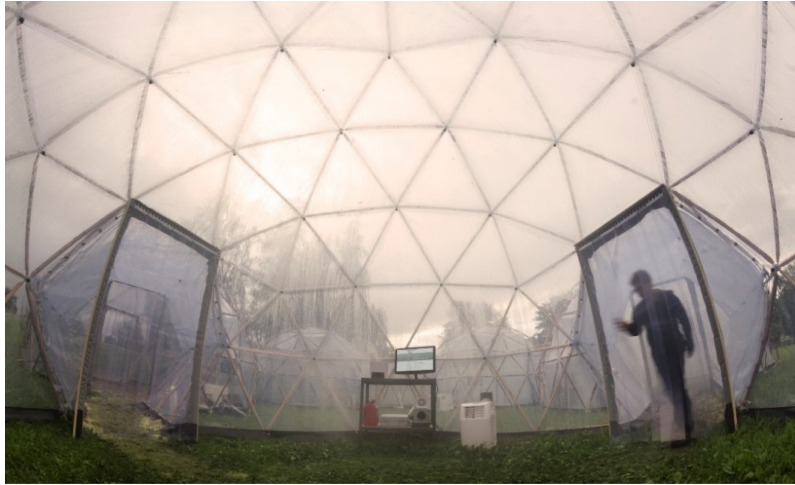


Fig. 3. Inside picture of Pollution Pods in Festningsparken in Trondheim, Norway, photo credit: Michael Pinsky.



Fig. 4. Pollution Pods in the courtyard of Somerset House, London, United Kingdom, photo credit: Michael Pinsky.

second, as part of a solo exhibition by Michael Pinsky in London, United Kingdom (see Fig. 4). The data collection in Trondheim took place for three weeks in June and July 2017, extending the period of Starmus Festival by two weeks. The art installation was accessible for eight hours every day. The PPs were exhibited in a public park about 15 min walking distance from the city center, with the aim of choosing a location available and frequented by citizens from diverse backgrounds. In London, data were collected at the arts venue Somerset House in the center of the city, which exhibited the PPs for one week in April of 2018 (<https://www.somerset-house.org.uk/whats-on/michael-pinsky-pollution-pods>). The research assistants at both venues were advised to inform the visitors in the following way:

“Welcome to the artwork “Pollution Pods”. This installation consists of five geodesic domes, containing the air of five different locations from all over the world. If you want to visit the installation, you first have to sign a liability voucher, that you are aware that even though the

air inside only simulates air pollution and does not contain harmful substances, the artists cannot be held liable, if anything happens to you inside. If you should have for example, an asthma attack or similar. We would also very much appreciate it, if you want to participate in a questionnaire study around the artwork. You just need to fill out two questions before you enter the pods, and a longer questionnaire after you came out again. Participation is voluntary and anonymous.”

All visitors of the installation PP during the data collection periods were asked whether they wanted to participate in the study; participation was not a precondition for access to the artwork. When entering, the visitors were asked to only go in one direction, so the order of cities was the same for all visitors. Pinsky chose the order consciously. First was Trondheim, with the clearest air, followed by London with the smell of diesel fumes and slight fog. Pinsky chose London, since this is where he lives, and he experiences the pollution every day. Next, visitors entered New Delhi the city with the worst pollution levels, high

humidity and temperature. The fourth pod, Beijing in winter, is set as a contrast to New Delhi regarding the temperature and the smells, and slightly lower pollution levels. Sao Paulo, the fifth pod, has higher temperatures again and different smells which numb the senses. Pinsky choose the locations based on a mixture of personal experience, differences in smell and levels of humidity and temperature to create the most impressive and diverse experience.

Most visitors came in groups or pairs, with their family and friends. Participants talked and shared their experience with their companions. The installation was never crowded: in London where people queued to visit the installation, the number of people per dome was restricted to five. Visiting the entire installation took between five and 15 min, depending on the time people spent in the domes.

Apart from the data collection around the artwork, data were collected from a comparison group in both Trondheim and London. In Trondheim, data collection for the comparison group took place in the city center during three days of a historic folk festival on the market square of Trondheim. This festival draws people from all over the region and from all societal groups. No artwork was shown to this group, and participants were only included in the comparison group if they had neither visited the PPs nor heard about them. Data from a London comparison group was collected among visitors of other sections of Somerset House who had not seen the artwork yet. If they decided to visit the PPs afterwards, they were subsequently excluded from the PP data collection.

The comparison groups provided a quasi-experimental test for effects of exposure to the PPs on pro-environmental behavior. Additionally, intention and behavioral measures allowed us to test for evidence of “Preaching to the choir” – environmental events attracting people with strong environmental awareness, intentions and pro-environmental behaviors. More specifically, a comparison established baseline intentions and behaviors in a population that had not selected to attend the PPs. Furthermore, a comparison group allowed us to compare socio-demographics of our PPs samples at the PPs to people attending a different event in the same city or an art event that was not specifically about an environmental problem.

Informational material was placed outside the domes in Trondheim and in the control location in Trondheim which either provided information about climate change, or air pollution, or no information to compare the effect of the experience versus information. However, there was no effect of this variable, so we do not discuss this manipulation further.

2.2. Measures

To get as close to measuring a real impact on behavior as possible, we teamed up with an existing platform for stimulating climate action based on logging and encouraging everyday behaviors. We used this platform as behavior measure in Trondheim, and participants received a log-in code to this online platform called ‘Ducky’ (<https://www.ducky.eco/en/>). The platform first calculates a personal carbon footprint and then suggests pro-environmental behavioral alternatives and encourages people to log them on the platform, see their CO₂-savings and share them with others. The platform also had a feature, which assigns the participants who logged on with our code to a group. The different groups were supposed to compete over who is saving the most CO₂ in a two-week period.

PPs visitors were also asked to fill out two questionnaires (see supplementary materials). The first questionnaire provided baseline assessment of intentions. The second, completed immediately after exiting the installation, assessed cognitive and emotional measures and post behavioral intention measures and demographic information. All cognitive items and the intention and emotional items were measured on a 7-point Likert scale. Dependent upon the question stem, the scales either ranged from either 1 (*not at all*) to 7 (*very much*) or 1 (*strongly disagree*) to 7 (*strongly agree*). The coding of the questionnaire was

readjusted to 0 (*not at all*) and 6 (*very much*) or –3 (*strongly disagree*) to +3 (*strongly agree*) to have more easily interpretable mean values in the analysis. Participants of the comparison group filled out a shorter questionnaire which measured pro-environmental intentions and behaviors (Trondheim group only – see below), demographics and cognitive measures. All measures represent averages of responses to the scale items noted below.

2.2.1. Behavioral intentions

Two items measured intentions to act on climate change and air pollution before entering the PPs with two items (“I intend to do something actively to prevent climate change/environmental problems in the future”).

2.2.2. Emotions

Emotions were measured with the question “To what extent does the artwork bring up each of these feelings within you?” followed by a list of the emotions derived from Sommer and Klöckner (2019) and Swim and Bloodhart (2015).

2.2.3. Cognitive measures

Participants were asked to provide their *reflections and reactions* to the specific experience with the PPs. Examples of items such as “The artwork made me think about the problem of air qualities in cities.” and “The artwork made me think and reflect on its meaning.”

A modified version of Lezak and Thibodeau (2016) *systems thinking* scale was used. The items were modified to fit the context of the study (e.g., “I gained a stronger sense of the connection between my actions and the well-being of people in other places” and “This artwork made me think about living conditions for animals and plants”).

Items measuring *awareness of consequences* (e.g. “The effects of environmental problems on public health are worse than we realize.”) and *ascription of responsibility* (e.g. “I feel partly responsible for the environmental problems on our planet.”) were based on De Groot and Steg (2009) and adjusted to the context of the PP. The items to measure *relevance for daily life* were also adapted from Sommer and Klöckner (2019), to capture how climate change and air pollution both can be perceived to affect people's daily lives. One example is the item “The artwork highlights environmental problems that would affect me personally.”

2.2.4. Covariates

We included control variables of art, lung health issues, climate change knowledge in our regressions that would likely be related to our dependent variables prior to exposure to art. *Experience with art*, which has been shown before to be associated with a more detailed experience of negative emotions (Fayn et al., 2018) and in-depth reflections on the artwork (Lin and Yao, 2018). It was measured with the question “What is your experience with art?” from 1 (*I am an art lover and go to exhibitions regularly*), 2 (*I like art, but I am not a connoisseur*), 3 (*Sometimes I like art and sometimes I don't – it depends*), 4 (*I don't really like art, but there are some exceptions*), to 5 (*I really dislike art and anything artistic*) as used by Sommer and Klöckner (2019).

Since the artwork focused on air pollution, we expected that people who have a history of chronic lung disease themselves or in their family would react more strongly to the artwork, or would show higher engagement in pro-environmental behavior, and decided to control for the *personal relevance* of these issues. This was measured via the question “Is ease of breathing an important topic for you or your family?” on a 7-point Likert scale 1 (*not at all*), 7 (*very much*). *Knowledge on climate change* was measured because greater knowledge is associated with more concern about climate change (Swim and Geiger, 2017) and those with more knowledge or concern may self-select into attending the PPs. Knowledge was measured using a four-item items from a knowledge measure developed by Simon et al. (2014). Items were selected that targeted climate change (e.g., rather than ocean acidification) asking

Table 1

Sample characteristics - means of continuous socio-demographic variables in comparison group (CG), Trondheim Pollution Pods group and London Pollution Pods group as well as results of an ANOVA with contrasts testing for differences in means between groups.

Variable	CG	Trondheim	London	df1	df2	F	CG vs. PP	Cohen's d	Trondheim vs. London	Cohen's d
Age (in years)	38.33	32.66	35.57	2	2661	30.29**	t (1397) = -6.04**	.27	t (1798) = 4.27**	.20
Knowledge about climate change ^a	3.34	3.31	3.34	2	2501	.42	t (2499) = -0.32	.01	t (2499) = 0.83	.04
Inexperience with art ^b	2.12	2.32	1.93	2	2679	50.27**	t (1404) = 0.16	.01	t (1732) = -10.23**	.48
Ease of breathing ^c	2.59	2.41	2.31	2	2638	.59**	t (1685) = -3.41**	.14	t (1744) = -1.26	.06
Intentions baseline ^c	2.33	2.52	2.73	2	2649	19.53**	t (1326) = 5.02**	.22	t (1838) = 3.72**	.17

Notes. * $p < .05$; ** $p < 0.01$; Cohen's d indicates the effect size. Very small effect sizes are not highlighted, however small (Cohen's $d < 0.20$) and medium (Cohen's $d < 0.50$) effect sizes are printed in bold.

^a Possible values range from 0 to 4 correct.

^b Possible values range from 1 to 5 with higher values indicating more experience with art.

^c Possible values range from -3 to 3 with higher values indicating more ease of breathing and stronger behavioral intentions.

questions such as "Why is the climate system changing?" offering four possible answers. The number of correct answers ranged from zero to four. This has been used repeatedly to measure knowledge on climate change among US American citizens (Swim and Geiger, 2017; Swim et al., 2017; Geiger et al., 2017).

2.3. Factor analyses of the measurement instruments

Because our measures had not been used before in previous studies, we conducted principle component analyses to reduce the number of variables to fewer components within the theoretical groups of interest, as described in the introduction. Before doing the factor analyses, however, we adjusted for missing data from 5% of the sample using the Expectation-Maximization Method (EM) due to a relatively large number of missing values with around five percent of every variable. Even though the overall data set was relatively large with 2662 participants, simple imputation was used as an adequate way of retaining as much information as possible from the data set and obtaining more reliable results (Schafer and Graham, 2002). Little's MCAR test ($\chi^2(1, 7801) = 8940.42, p < .001$) indicated that the data is most likely not Missing Completely at Random (MCAR). To determine if this lack of randomness was problematic, a sensitivity analysis was conducted to see whether the data was Missing at Random (MAR), a prerequisite to imputation. This analysis indicated that significance patterns were identical between regressions with imputed and with non-imputed data, and therefore we opted for including more data points in our analyses.

After the imputation, we divided the variables that were used to predict changes in intentions into four blocks (1) negative emotions, (2) positive emotions, (3) general reflections on artwork and global systems, such as other people, ecosystems, animals and future generations, (4) cognitive variables on personal relevance of climate change (ascription of responsibility, awareness of consequences and relevance for daily life). Identifying differences within negative emotions and within positive emotions could inform future psychological research in environmental psychology and empirical aesthetics on emotional reactions to art, as suggested by Silvia (2007; 2009). Principal component analyses (PCA) with oblique rotation was applied and cross-factor loadings lower than 0.30 were used to eliminate items. After the PCAs, mean scores for all items loading high on one component were calculated. The number of factors was determined for all the PCAs based on the Likelihood ratio test (LR test) which chooses the best model, using a log-likelihood function. Next, we checked the output for components with cross-loading, which were then excluded from the component. Apart from the PCA for general reflections and systems thinking which revealed two factors, all the variables in the second component had cross loadings with the first component. Therefore, the PCA for general reflections and systems thinking was rerun with one factor only.

The factor analyses revealed the following. PCA of negative emotions resulted in three components: (1) moral emotions of guilt and

shame ($M = 1.78, SD = 1.47, \alpha = .76$), and (2) negative uncertainty emotion of anxiety ($M = 2.20, SD = 1.74$) and the remaining negative emotions of (3) sadness, helplessness and anger ($M = 2.29, SD = 1.37, \alpha = 0.69$). PCA of positive emotions resulted in three components: uplifting emotions of awe, inspiration and surprise ($M = 2.28, SD = 1.23; \alpha = 0.52$), positive uncertainty emotion of hope ($M = 1.45, SD = 1.48$); and the remaining positive emotions of happiness and pride ($M = 1.01, SD = 1.25; \alpha = .66$). PCA of the first block of cognitive variables, resulted first on two factors but was then rerun with one factor, since all variables in the second factors had cross loadings with the first factor. The resulting factor will be referred to as *general reactions and reflections on the artwork and global systems* ($M = 3.36, SD = 1.28; \alpha = 0.94$). Last, PCA revealed three factors for the second set of cognitive variables: awareness of consequences ($M = 1.75, SD = 0.99, \alpha = 0.64$), ascription of responsibility ($M = 1.13, SD = 1.30, \alpha = 0.69$), and relevance for daily life ($M = 1.08, SD = 1.36; \alpha = 0.84$). Two items (one ascription of responsibility and one relevance for daily life) were excluded due to cross loadings on other components.

3. Results

3.1. Participants

In Trondheim, responses were obtained from 1016 visitors of PP and an additional $N = 415$ in the comparison group. In London, responses were collected from 851 visitors of PP and an additional $N = 380$, in the comparison group. Socio-demographic characteristics among the two PP groups and combined comparison groups are presented in Table 1.

Preliminary analyses comparing the PP and comparisons groups were tested for possible relatively unique characteristics of people visiting the PPs relative to our comparison groups representing attendees to events that did not represent the unique combination of art and environmental problems. The two comparison groups were combined into one group to make the sample sizes across comparisons similar. For the two categorical variables gender and education chi-square tests were calculated. On average, there were 56 percent women with no significant differences for gender between the PP group and the comparison group ($\chi^2(1) = 0.84, p > .05$) nor between the two PP groups ($\chi^2(1) = 1.25, p > .05$). While the PP groups were more educated than the comparison group, the effect size was very small ($\chi^2(3) = 12.94, p < .05$, Cohen's $d = 0.07$). In contrast, the education level between the Trondheim and London PP groups had a large effect size ($\chi^2(3) = 279.56, p < .01$, Cohen's $d = 0.79$). The distribution of participants indicates that London had the highest percentage of university graduates with nearly all being university graduates (79%, 15% college degree, 3% high school diploma, 3% primary school). In contrast, in Trondheim the education distribution was more diverse, yet still with a majority holding a university degree (46%, 18% college

degree, 25% high school diploma; 11% primary school).

An ANOVA compared the three groups on continuous variables measured prior to experiencing the art that could influence reaction to the artwork (see Table 1). We had asked participants separate questions intending to do behaviors that would address air pollution and climate change. They were strongly correlated with each other, $r(2217) = 0.89, p = .00$. Given this similarity, we averaged these two questions together into one measure. The two groups of PP visitors were younger than the comparison group, had stronger pro-environmental intentions, and less problems with 'ease of breathing' with medium, small, and very small effect sizes, respectively (see Table 1). The London PP group had stronger pro-environmental intentions, was older and had more experience with art than the Trondheim PP group with small effect sizes for age and intentions and medium effect sizes for experience. More art experience found in our London participants is likely because the venue in London was an arts venue. In sum, based on effect sizes, meaningful differences between groups were restricted to age and art-experience of participants. The difference in baseline intentions, though with a small effect size, will be addressed in the discussion.

3.2. Changes in behavior through the art experience

All the participants in the PP and comparison groups from Trondheim were asked to join the online platform 'Ducky' where they could calculate their carbon footprint and log the behavior they did reduce to reduce their footprint. Unfortunately, only few participants joined the platform (PP: 2%, $n = 24$; CG: 0%, $n = 4$). This meant that we were unable to analyze the behavior logged on the platform. A χ^2 test did not reveal a significant difference in the rate of joining the platform between the groups ($\chi^2 = 3.00$; $df = 1$; $p = .08$). Therefore, the behavior measure was not repeated in the London data collection. The implications of the very low level of participation will be discussed in the Discussion section below. H1 could therefore not be answered conclusively.

3.3. Changes in intentions through the art experience

We predicted that the artwork 'Pollution Pods' would trigger an increase in intention to act in its visitors (H2). We tested for changes from before to after the PP experience for both intentions to address pollution and climate change with a $2(\text{Time: Pre vs. Post}) \times 2(\text{Topic: pollution vs. climate change})$ repeated measures ANOVA. The analyses revealed an interaction between time and topic, $F(1, 1767) = 24.67, p = .00, \eta^2 = 0.01$. Follow-up comparisons indicated increases for both pollution intentions ($M = 5.67, SE = 0.03$ vs. $M = 5.71, SE = 0.03$) and climate change intentions ($M = 5.58, SE = 0.03$ vs. $M = 5.67, SE = 0.03$). The difference was stronger for climate change because the initial intentions to address pollution were stronger than final intentions. As with the pre-measures, because the intentions to address pollution and climate change were highly correlated, $r(2217) = 0.89, p = .00$, and we found differences on both measures, we averaged the two mentions together to form one measure. Notably, a dependent t -test indicated that mean intention after the Pollution Pods ($M = 2.69, SD = 0.03$) were higher than before the PP ($M = 2.62, SD = 0.03$), $t(1778) = 3.27, p < .01$. However, the effect size (*Cohen's d* = 0.07) was very small, providing only partial support for hypothesis H2. Because the PP groups' baseline intentions were significantly higher than the comparison groups' intentions (see Table 1), we did not compare the comparison group to the after intentions in the PP groups.

3.3.1. Influences of environmental psychological variables on changes in intentions

A difference score between intentions after versus before was calculated, such that higher numbers indicate having strong intentions before than after experiencing the PPs. This difference score was

regressed on emotions (H3) and cognitions (H4) to test our prediction that they would be positively associated with an increase in intentions on the individual level. A possible ceiling effect was controlled for by adding the intentions before as a predictor to all regression models.

We included covariates in the regression either because of differences between the Trondheim and London PP sample (education, age, experience with art, intentions, see Section 3.1) or because they may be associated with our predictor and independent variables and we wanted to rule them out as reasons for effects for our predictor variables. Because we collected data in two locations, we initially included interactions between all variables and the location of data collection (Trondheim vs. London) to test whether any of the socio-demographic variables or emotional and cognitive factors would interact with the location in which the Pollution Pods were exhibited. From all possible interactions (six socio-demographic variables and ten factor variables) none showed a significant effect. Therefore, we only include location as control variable into the regression models to account for possible differences between people from the two locations not captured by our other covariates.

Four regression models were tested to explore for differences in strength of predictors (see Table 2): (1) intentions and socio-demographic variables as predictors (a) base model to compare with latter models, (2) intentions and socio-demographic variables and emotions as predictors (H3), (3) intentions and socio-demographic variables cognitive factors (H4). (4) Finally, all influencing variables were added in a fourth model. Model 4 was tested because empirical aesthetics provides mixed evidence as to whether art provokes emotions or cognitions first (Pelowski et al., 2017) and we wished to test the strength of their effects after controlling for the other factor.

All four models have an overall significant F -value, providing evidence that the independent variables in the models improve the fit of the model. The adjusted R^2 values give an indication of how much the model fit improved with the additional variables, which is more by adding the cognitive than the emotional factors (see individual model results below).

Intention before was positively associated with changes in intentions, with the highest (negative) standardized coefficient across all variables and models. This means that those who already reported stronger intentions prior to experiencing the PP had less positive change in intentions from before to after the experience.

The first model revealed that, if the participant was a man, older or had less experience with art, the participant was less likely to change his/her intention. Additionally, the more the participant was educated, or concerned about ease of breathing or 'in London', the more likely a change of intention was detected.

Adding the emotion factors in the second model improved the ability to predict change in intentions and most of the associations were positive. *Sadness, helplessness and anger* showed the largest beta-coefficient with changes in intentions, followed by *awe, inspiration and surprise, guilt and shame* and *happiness and pride* – the latter was the only significant negative association. However, all emotional effects were small and the adjusted R^2 only increases by 3% between the first and second model.

As illustrated in the third model, all cognitive factors showed a significant positive association with changes in intentions, with *ascription of responsibility* showing the highest standardized coefficient. The adjusted R^2 increases by 14% between the first and third model. In this model, gender and experiences with art were no longer significant predictors of changes in intention.

In the final model that included all variables, age and education as well as all cognitive variables were again associated with changes in intentions. Regarding the emotional variables, only the factors that was the strongest predictor in the second model (i.e., sadness, helplessness and anger) was positively associated with changes in intention. The adjusted R^2 increased again by 14% with respect to the first model.

Table 2
Summary of block-wise regression analysis for variables predicting changes in intentions.

Variable	Model 1 (N = 1702)			Model 2 (N = 1702)			Model 3 (N = 1702)			Model 4 (N = 1702)		
	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
Intentions before	-0.29	0.02	-0.42**	-0.31	0.02	-0.46**	-0.41	0.02	-0.59**	-0.41	0.02	-0.60**
Socio-demographics												
Gender	-0.22	0.04	-0.13**	-0.17	0.04	-0.10**	-0.06	0.04	-0.04	-0.06	0.04	-0.04
Age	-0.01	0.00	-0.13**	-0.01	0.00	-0.11**	-0.01	0.00	-0.12**	-0.01	0.00	-0.12**
Education	0.05	0.02	0.06*	0.06	0.02	0.06**	0.06	0.02	0.06**	0.06	0.02	0.06**
Inexperience with art	-0.10	0.02	-0.09**	-0.08	0.02	-0.08**	-0.04	0.02	-0.04	-0.04	0.02	-0.04
Knowledge of climate change	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.02	0.03	0.04	0.02	0.03
Ease of breathing	0.06	0.01	0.12**	0.05	0.01	0.11**	-0.01	0.01	-0.02	-0.01	0.01	-0.02
Location	0.08	0.04	0.05*	0.06	0.04	0.03	0.03	0.04	0.02	0.03	0.04	0.02
Emotion	B	SE B	β	B	SE B	β	B	SE B	B	B	SE B	B
Factor 1 – Sadness, helplessness & anger				0.06	0.02	0.10**				0.04	0.02	0.07*
Factor 2 – Guilt & shame				0.03	0.02	0.06*				-0.03	0.02	-0.05
Factor 3 – Anxiety				-0.01	0.01	-0.02				-0.02	0.01	-0.03
Factor 4 – Happy & pride				-0.04	0.02	-0.06*				-0.02	0.02	-0.03
Factor 5 – Hope				0.02	0.01	0.04				0.01	0.01	0.02
Factor 6 – Sense of awe, inspiration & surprise				0.06	0.02	0.08**				0.02	0.02	0.03
Cognitions	B	SE B	β	B	SE B	B	B	SE B	B	B	SE B	B
Factor 1 – General reaction and reflections on the artwork and global systems							0.10	0.02	0.15**	0.10	0.02	0.14**
Factor 2 – Awareness of consequences							0.10	0.02	0.12**	0.10	0.02	0.11**
Factor 3 – Ascription of responsibility							0.17	0.02	0.27**	0.18	0.02	0.28**
Factor 4 – Relevance for daily life							0.04	0.02	0.07*	0.04	0.02	0.06*
Adjusted R ²		0.18			0.21			0.32			0.32	
F for change in R ²		48.72**			32.90**			68.27**			46.20**	

Note. *p < .05. **p < .01.

Coding: Gender: 0 = female, 1 = male; Education: 1 = primary school diploma, 2 = college or technical degree; 3 = High school diploma, 4 = University degree; Higher numbers in predictor variables indicate greater knowledge, more ease of breathing, less previous experience with art, and more intentions to engage in pro-environmental behaviors before experiencing the Pollution Pods, stronger emotions, and stronger cognitions: see text under ‘Measures’.

4. Discussion

The aim of this study was for an artist to create an immersive experience with air pollution which would presumably be relevant to climate change and to investigate the effect of this artwork on pro-environmental intentions and behaviors and psychological mechanism that provide insights in possible mechanisms by which they alter pro-environmental intentions. We conducted a questionnaire study around the immersive art installation Pollution Pods (PP), created by environmental artist Michael Pinsky and psychological predictors based on findings from environmental psychology and aesthetics. Data was collected from two different venues, a public park in Trondheim, Norway and the arts venue Somerset House in London, UK.

4.1. Behavior

We cannot come to a strong conclusion about effects of the exhibits on pro-environmental behaviors (H1) because the rate of participants who even registered to join the platform to assess behavioral change was very low. The low sign-up raises the question as to whether the artwork did not reach its goal to motivate people to make changes in their daily life's, or whether there was another reason preventing participants from joining the platform. It may be that the problem is the platform and not changes in behavior. It is possible, that the step to accept a personal code, log on, and track the personal carbon footprint was too big. Unfortunately, the platform was not available in the form of an app, but only via the browser, which might have added to the difficulty in using the program. It is also possible, that participants engaged more in environmental behavior as a result of their experience, but failed to report it online. A solution could have been, that the research assistant could have logged on with the participants for the first time at the venue. That way the participants only needed to log their behavior daily on the platform.

Generally, environmental psychologists struggle with implementing behavior measures in their studies. Often, they demand repeatedly information on personal behavior, such as the number of meals

containing meat, or how long the person showers. Researchers rely on reported information or on approximations through other variables, such as intention to act environmentally. With ‘Ducky’ we would have received several different behaviors, from transport, meal and bigger consumption choices, associated with the attached carbon footprint. We argue, that it is important to try to implement behavior measures in studies, despite associated difficulties, especially since participants through all groups reported high intentions to act, which we cannot say if it translated into behavior or not.

We need to acknowledge though, that there is a possibility that people were initially motivated by the PP to act, but that this motivation was lost after their experience. That people's attitudes often do not correspond to their behavior is a well-known finding and has also been documented in the environmental domain (e.g., Boulstridge and Carrigan, 2000; Juvan and Dolnicar, 2014). So even if the PP succeeded with activating people's emotions and cognitions, it is not unlikely that the action did not follow from intentions. For artists, this means that the art experience alone cannot be expected to make people change their behavior, but that other measures helping people to act upon their intentions need to be implemented after the art experience.

4.2. Intentions

Participants reported stronger intention to act on climate change and air pollution after the PP (H2). It is also notable that this effect was present for both changes in intentions to address pollution and climate change. This suggests that at a general level, participants did not differentiate between the two types of behaviors and potentially a reason why interventions that address air pollution may be effective at addressing a range of pro-environmental behaviors. However, it is also notable that increases in intentions were, on average, very small. This small increase might be because participants at the PP started with strong intentions before entering the installation, suggesting a strong ceiling effect in our measurements of intentions. It is also possible that those most likely to have high intentions were also likely to visit the PPs. Supporting this assumption, the PP groups had stronger intentions

than the comparison groups (see Section 3.1) and those who had stronger intentions entering the PPs showed less change in intentions. Thus, the small effect strong intentions at the start of the study could possibly explain little changes in behaviors – participants may have reported intending to do the behaviors because they did them before visiting the venue. On the other hand, it is notable that given the likelihood of prior strong intentions, the PPs were able to increase participants' intentions. Roosen and Klöckner (under review), ran a qualitative study with interviews of visitors of the PP and found that participants reported an increase in motivation to change their behavior suggesting that the change over time was not a measurement problem.

Other reasons than self-selection as to why those who visited the PPs may have had stronger initial intentions to engage in PPs prior to visiting the PPs than our comparison group may be a special effect of art. Seeing the PP from the outside may have made already existing intentions more salient or prompted first reflections, leading to an increase in intentions pre-visit. A recent study by Pelowski et al. (2017) shows that calling an object 'art' influences the way it is being perceived by the spectator, associated with increased liking, higher aesthetic ratings, and even a search for the artist's intention. Accordingly, it seems probable that participants who were aware of visiting an environmental artwork would experience salient environmental intentions and that the differences in intentions between the comparison group and the PPs groups hint at a priming, and not at a sampling bias. This would mean, that we may not have been able to detect differences from before to after visiting, because the PPs had their strongest effect before even entering them. It needs to be recognized in this respect that the "before intentions" were measured after the participants received their instructions about that the PPs.

4.3. Baseline differences predicting change in intentions

A base model determined that if the participant was a man, older or disliked art more, they were less likely to change their intentions. The results for gender and age are in accordance with earlier findings on the relationship between socio-demographics and environmental concern: women more than men (Buttel, 1979; Jones and Dunlap, 1992; Kanagy et al., 1994; Ozanne et al., 1999) and younger people have been reported to be more environmentally concerned than older people. It is notable that effect of gender was no longer significant when our cognitive variables were included in the model suggesting that differences between women and men were a result of the different way they think about the environment. We conclude from this, that artists, curators and environmental communicators should consider how especially those groups could be addressed with environmental art. For example, they may want to particularly target thoughts, perhaps especially those regarding ascription of responsibility given its relatively strong association, to reach men.

We also found that experience with art increased changes in intention. Studies on the connection between art experience and the perception of art have shown that art expertise is associated with greater flexibility in art appreciation (Leder et al., 2012) and reduced emotional responses to provocative or negative art (Leder et al., 2014). This seems to indicate that even though participants less familiar with art might have experienced the PP more emotionally than art experts, they were less inclined to change their appreciation of the artwork, and therefore possibly their reflection and intentions. As with gender, the effect of experience with art was no longer significant when our cognitive variables were included in the model suggesting that the effect of experiences was because those with more experience think differently about the environment than those with less experience. We interpret these findings as suggesting that efforts to communicate the urgency of addressing climate change should be exhibited outside of the traditional museum and gallery setting, to reach people less experienced with art, as happened in our Trondheim venue, and when doing so should

address thoughts, perhaps especially those regarding environmental consequences and ascription of responsibility.

Last, more education, and more concern about ease of breathing were associated with an increase in intentions. These results are as expected and in alignment with previous findings (Jones and Dunlap, 1992). We also found that intentions was associated with visiting in London more so than Trondheim. In London, air pollution is a bigger problem than in Trondheim, possibly leading to a higher sensitivity to the issues presented (air pollution indices were taken from the website: <https://plumelabs.com/en/air/>).

4.4. Emotions predicting change in intentions

Both negative (sadness, helpless and anger; guilt and shame) and positive emotions (sense of awe, inspiration and surprise; happiness and pride) were associated with changes in intentions. All associations were positive, except for happiness and pride. Thus, a mixture of emotions is important to predicting change in intentions perhaps suggesting that it is the strength rather than the valence of the emotional reaction to the art that predicts changes in intentions. The exception was that visitors who experienced happiness and pride while viewing the artwork were less likely to increase their intentions. Perhaps participants who felt happy and proud about the fact that the air in Trondheim and London was still much better than the air in New Delhi, Beijing or Sao Paulo also felt that there was no need for them to do something about conditions somewhere else in the world. This happiness about not being affected was found by Roosen and Klöckner (under review) qualitative study of the same exhibit and they described it as a defense mechanism which allowed people to distance themselves from the harsh reality. According to them, participants experienced mostly shock, but also grief, sadness, surprise, fear but also gratitude to live in a place that is not that affected by environmental pollution and climate change.

In the present study, only sadness, helpless and anger, were significant predictors of changes in intention after controlling for cognitions. This suggests that there is a connection between the remaining emotions and changed thoughts about the environment. For example, guilt and shame are likely prompted by feelings of responsibility and the findings suggest that the latter may be important for explaining the effects of guilt and shame on changing behaviors. The positive emotions may also be tightly related to cognitions, for example, perhaps their intensity is closely connected to being experientially close to the consequences.

4.5. Cognitions predicting changes in intention

Adding cognitive predictors to the base model resulted in a considerable increase in explained variance. All cognitive predictors were positively related to changes in intentions, suggesting that environmental art should encourage reflection on one's personal place in an environmental system, social connections, temporally removed effects, and the general connection between one's actions and environmental effects. Further, as noted above, it appears that cognitions account for many of the effects of emotions on changes in intentions. Based on these results, we recommend that an artwork communicating an environmental issue to its spectators should feature an aspect that highlights personal responsibility, as well as personal consequences of climate change. Roosen and Klöckner qualitative study similarly indicated that the PP have achieved to highlight personal responsibility and awareness of consequences.

Importantly, however, it is not necessarily the case that a small increase in the adjusted R^2 between the baseline socio-demographic and the model including emotions, in comparison to the increase in R^2 including cognitions, indicates that cognitions are more important. An alternative explanation could be, that emotions function as a first "relevance detector", while the cognitions fit this arousal into a context (Öhman et al., 2001; Grandjean and Scherer, 2008). Alternatively,

measurement similarity could explain the difference: because cognitions and intentions are both thoughts, cognitions may better explain changes in intentions than emotions. Therefore, future research should investigate which of the different options is more likely, since emotions and cognitions are generally playing a big role in the field of art perception (Pelowski et al., 2016).

4.6. Limitations and future directions

As we note above, there may be an effect of the PPs prior to even entering them. In other words, the anticipation of the event – especially after having received the instructions – might have already triggered the reaction. Thus, future research should control the anticipation of seeing an environmental artwork, either by visually shielding the art, including participants who unexpectedly visit an artwork, or by triggering a similar anticipation in a comparison group. Even though visually shielding the PPs would not have worked, since Pinsky reckoned the surroundings to be an essential part of the installation, it could be applied with another form of artwork. Also, the location of the PPs in a public park in Trondheim led to people encountering the artwork by chance, however, the research assistants could welcome visitors without mentioning the work ‘art’.

The measurement of intentions before and after the PPs was limited in its success. One possible explanation is that participants were unable to express a possible increase due to the constraint of the measurement scale. In interviews as reported by Roosen & Klöckner (under review), visitors reported that they were touched by the experience and subjectively indicated an increased intention to act. These results suggest that visitors increased their intentions but our measure may not have captured the strength of the impact on intentions, which underlines the importance of a functioning behavior measure.

We cannot tell how long the impact of the experience will last, although the very weak response to our behavior measure seems to indicate that the effect might be rather limited in time. The importance of intensity of emotional experience, as we interpret the impact of a range of positive and negative emotions on changes in intentions, suggest that the more people felt the experience was immersive, the more impact it had on them. This is echoed in the results of the qualitative study of the same event (Roosen & Klöckner, under review), which found that participants felt that experiencing the conditions in the pods was much more powerful than reading information about it. Thus, future research should test long term impacts of experiences with highly experiential art such as the PPs. They might also explore if labelling an experience as “art” might even make it easier for people to distance themselves from it when stepping back into their everyday life. In a similar vein, an important avenue to follow up on in future research might be to look further into the connection between appraisal – whether people personally liked the artwork – and its potential behavioral impact.

Another limitation of the study is that our study with the focus on emotional and cognitive reactions to art does not take into account different sensual experiences that visitors must have made in the PPs. A strand of research called “sensory ethnography” would be especially useful for following up with the impact of perceptual aspects such as smell and touch (Pink, 2015).

Moreover, only one art installation – the PPs – and not a range of different environmental artworks was evaluated. Art perception and art appreciation is very subjective, and as we could see in our data, influenced by socio-demographics such as experience with art, age and education, as well as psychological factors. This is congruent with findings from Leder et al. (2004) and Silvia (2006). However, though the generalizability of these results is of course limited by the single artwork under study, more evidence from studies on single exhibitions (e.g. Pelowski et al., 2018) will present important conclusions.

5. Conclusion

Our work points to the value of large scale immersive art for communicating the perceptually linked concerns about air pollution and climate change. Even though the main questions whether environmental behavior can be triggered by the experience of environmental art remains open, we can shed light on how environmental art influences environmental intentions. Recommendations for environmental communicators can be deduced on how they can benefit from art as means of communication:

Environmental art can reach people outside of the circle of usual suspects, such as men, older people and people less experienced with art, when it is exhibited outside of the traditional museum and gallery setting. The artwork is especially impactful for these groups of people and may be most effective if it elicits reflections, systems thinking and thoughts about awareness of negative consequences of climate impacts, relevance to oneself personally, and ascription of responsibility. It seems particularly important to encourage personal responsibility. Moreover, sadness, helplessness and anger seemed to be the emotions that had the most impact on changes in intentions, so artists and communicators should not be afraid to trigger them with their messages.

There are many barriers to environmental communication, and it is difficult to increase awareness for climate change and air pollution, especially in a world filled with a multitude of information and many distractions. However, as Pelowski et al. (2017) describe art – classifying an object as piece of art gives the experience an extra meaning and as such could garner attention in the midst of other distractions.

Future research and practice will further clarify the role that immersive art installations can play in pro-environmental communication, and lead to interesting and effective avenues for the promotion of positive global change.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

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