

How Art as a Vehicle for Ideas-Based Ideologies Can Facilitate the Understanding of Climate Change and Help People Explore a Speculative and Sustainable Future

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Abstract

Climate change is impacting on all aspects of contemporary life. Many artists provide a compelling vision for speculative futures, awakening a creative consciousness using imagined worldviews. This paper presents my practice-based research that aims to establish how visual art can engage with issues-based concepts and ideologies through the presentation, re-presentation, and interpretation as a framework for engaging with climate change issues and realigning society to sustainable futures. This paper takes theory, and artistic practice as methods means to respond to themes and issues of climate change. In the context of practical research, the arts-based approach and art theory research alternate between planning, theoretical research, practical action, reflection, and evaluation. Through digital art, this study creates a discursive space that relates to daily life, where people can deeply understand the interconnecting relationships between humans and the planet; simultaneously, it also shows people an achievable ecological future and encourages people to think and find an existence conducive to all. This existence is not the present, but a possibility for human beings to explore the future through the reshaping and reimagining of the present.

Keywords: Climate Change, Digital Art, Sustainability, Speculative Future, Practice-Based Research

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1. Introduction

With the accelerated development of economic globalization, many GHG and pollutants produced by human activities have caused a severe climate crisis. They not only destroy the balance of the natural ecological system and the symbiotic relationship between the earth and human beings, but also bring about negative socio-economic and political consequences to all countries in the world [28],[40], [54]. The International Plant Protection Convention (IPPC), World Meteorological Organization (WMO), United Nations Sustainable Development (UNSD), United Nations Environment Programme (UNEP), and United Nations Development Programme (UNDP) all reveal the harm of climate change and its serious consequences [28], [61]-[63]. Climate pollutants impact on all aspects of the Earth, such as food shortage, the decline of biodiversity, sea-level rise, and extreme weather, destroying human life, the national economy, and the earth's ecological environment. The climate issue is complicated because it involves politics, economics, culture, and society. It needs to be widely viewed and co-governed on a global scale. It needs to go deeper into the social ecology and the human spiritual ecology to reimagine contemporary life for sustainable futures [40].

In view of the climate problem, more and more influential artists have constructed new ways to express ecological ideas within their practice and respond to the environmental crisis [4], [11], [17]-[20], [27]. At the individual level, artists such as John Sabraw, Eve Mosher, Zaria Forman and Tomás Saraceno adapt art forms to express the consequences of human social activities on climate change [16], [31], [57], [58], [65]. These artists utilise creative expression in invoking emotional resonance for our global futures. Through their works, audiences appropriate through various visual language messages about coexistence and harmonious life with the planet and our natural resources. At the community level, through art activities, projects such as *Cape Farewell*, *GoodPlanet Foundation*, and *Aerocene* engage audiences in unique ways, actively encouraging people to participate in solving environmental problems, changing people's behaviour and attitudes towards the environment [8]-[10]. At the social level, art can be combined with other disciplines to convey knowledge about climate change to people from a unique perspective. It informs and engages relationships between humans and the natural environment and builds ecological intelligence [49], [55]. Concisely, art as a visual language engages, informs, and transforms at a social level, community level, and individual level.

Through six case studies, this paper critically engages creative and artistic languages as transformative vehicles in the space of climate change and global environmental challenges. As artist Bergit Arends proposes that “*environmental change can be identified by artists through the use of archives, its materials, structures and procedures*” [3]. Consequently, artists can develop narratives between events in time, between environmental space and creative archives, thereby creating a new vision in the space of environmental issues and ecological concerns. Art-making constructs narratives and metaphors that tell transformative stories within the space of climate change. Creative approaches affect people's values and feelings; ultimately, they may lead to a process of change at the individual level. Inspiration, as an incentive factor in the process of change, helps people make changes more excitingly and positively [3][10]. Creative narratives and metaphors influence people's thinking and values and deepen their understanding of key issues in the space of climate change. Due to the development of society and culture, the discourse on speculative futures has gradually attracted human attention. What is the future? It is a concept that does “not-yet-exist” but is about to appear [5], [6]. Tomorrow is the future of today, while the present is the future of the

past. Throughout the development of human history man has tried to attain a better life that is always becoming and revealing [1], [6], [7], [26], [36], [51] Indeed, these possibilities are a state in which the world itself exists and a state of existence in the future of new things [7], [21], [26].

This paper is practice-based research. In the early stage, it mainly focuses on the representative work of influential artists, such as *7000 Oaks* by Joseph Beuys, *Wheatfield—A Confrontation 1982* by Agnes Denes, *The Weather Project* by Olafur Eliasson, *the AMD conversion project* by John Sabraw, *HighWaterLine* by Eve Mosher, *Antarctica* by Zaria Forman, *the Nine Wave* by Cai Guo-Qiang, *the Aero-Solar Museum* Tomás Saraceno, *Underwater Sculpture Park* by Jason deCaires Taylor, *Waters of a lower register* by Allison Janae Hamilton, *Human Sensor* by Kasia Molga and so on. The purpose is to deeply understand how they express and participate in environmental problems in the language of art; how to transmit knowledge or information related to ecological issues or sustainability through art; how to influence people's attitudes, experiences, morality, and values through artistic emotion; and how to influence and shape the audience's response to the concept of long-term sustainable development and ecological thought through artistic experience. Through in-depth reflection on the works of these artists, I believe that visual narration and visual metaphor play a great role in changing lives in the space of climate change. Specifically, the expression of art can be connected with other disciplines to explore materiality and deepen people's understanding of environmental or ecological problems such as climate change [2], [17], [30], [32], [33], [35], [46]. The emotional exchange of art can change people's attitudes towards the environment and natural ecology, change the relationship between humans and non-humans, and shape sustainable values [15], [22], [25], [49]. The transcendence of art can help people look back on the past, face the present, look forward to the future, redesign the current life and realize the future [12], [14], [15], [38], [39], [41]. Through art to build an environment that is related to human daily life, can promote communication between people and climate change, thereby shaping, changing, and promoting a speculative and sustainable future.

2. Materials and Methods

2.1. Research process

The theoretical and philosophical ground of this study encompasses the ecological thinking on ‘*hyperobjects*’ of Timothy Morton and Ernst Bloch’s concepts of ‘*speculative materialism*’ and ‘*ontology of not-yet-being*’. Bloch believes that art as a unique way of life carries a core track of hope [5], [21]. It reveals current issues and reviews historical experiences and lessons of the past. It is an infinite laboratory of potentiality. Morton believes that climate change is unfathomable; people can only experience parts or consequences of it as an object. The ambiguous metaphorical qualities of art express in sensual ways what is challenging to express in words. It gives a glimpse of what exists “beyond or between our normal categories” [39]. In a word, climate change is closely related to humans, and it is closely related to the present and future. Through metaphorical visual language, we can rethink the present and speculate about the future.

2.2. Aesthetics research and interdisciplinary research

This project conducts simultaneously interdisciplinary theoretical perspectives and visual research on the representative works of artists engaging in climate change. The focus of

aesthetic research is the language of artistic creation, artistic cognition, artistic emotion, and the aesthetic experience of artistic creation. The purpose is to integrate multi-disciplinary issues better to explore further and answer this project's research questions, thereby seeking an effective way to strengthen the communication between humans and the natural ecosystem and improve people's understanding of the environment and future life.

Many scientists reveal climate change to people through meteorological data, but this data cannot give people an intuitive feeling. To narrow the gap between climate science and art, a range of artists have developed interdisciplinary approaches to deepen an understanding of climate change. *Atmospherics/Weather Works (2003)* (figure 1) by Andrea Polli, *Wind Map (2012-present)* (figure 2) by Martin M. Wattenberg, and *Wind of Boston: Data Paintings (2017)* (figure 3) by Reflik Anadol create a perceptual language for emotional communication [23], [43], [45], [52]. They present new perspectives and new ways of understanding data that enhance the perception and consciousness of the changing climate.



Figure 1: *Atmospherics/Weather (2003)* Works by Andrea Polli collaborator Dr Glenn Van Knowe.

It aims at converting meteorological data collected in 1991 into sound using algorithms to convey emotional content or emotion, thereby improving human understanding of the power behind data and the impact of climate change. The advantage of this work is that it not only makes boring data interesting but also integrates the artist's emotional content or emotion.

wind map

August 30, 2021
11:40 am EST
(time of forecast download)

top speed: 27.7 mph
average: 6.7 mph

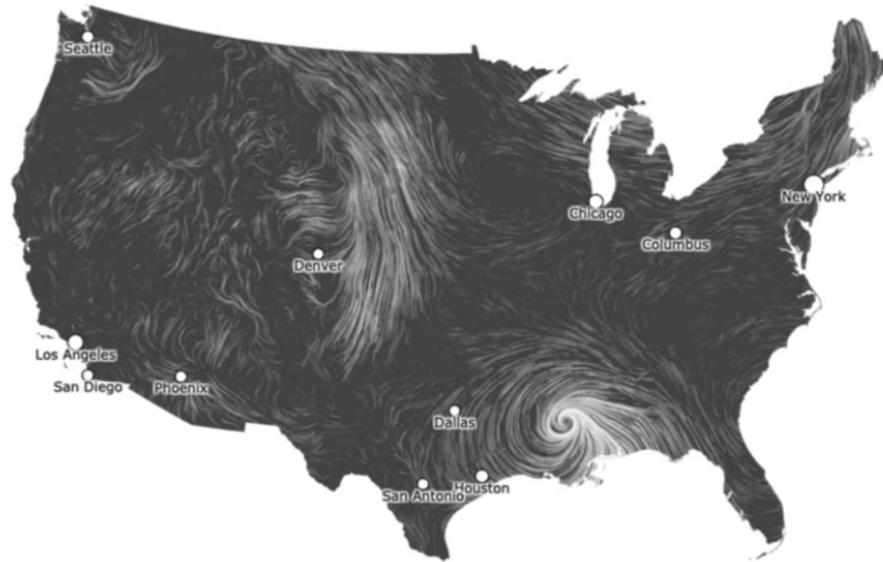
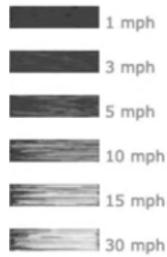


Figure 2: *Wind Map (2012-present)* by Martin M. Wattenberg. It visualizes the airflow data in the cold winter in the US, showing the impact of climate change on American daily weather.

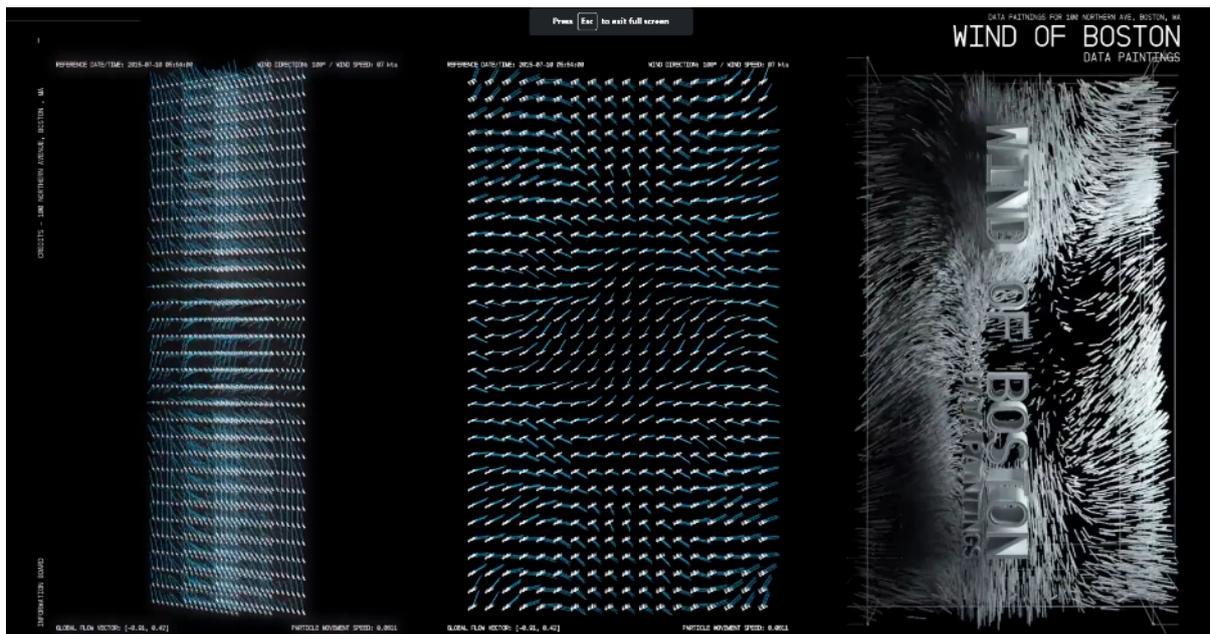


Figure 3: *Wind of Boston: Data Paintings (2017)* by Reflik Anadol. By developing a series of customized software and using algorithms, it visualizes the one-year data set collected from Boston Logan Airport. It triggered a series of works exploring climate change and the beauty of nature and conveyed information about specific climate change.

According to Laurie Frick's research, 25% of global emissions come from food. In *What We Eat (2020)* (figure 4), she intuitively shows the impact of dietary behaviour on climate change [18], [37]. In contrast, Paolo Cirio, in his work, states that the one hundred significant oil, gas, and coal producers have generated over 70% of greenhouse gas emissions, causing considerable problems in human society, ecosystems, and their endangered species. His work

Climate Tribunal (2021) (figure 5) represents the legal responsibilities of fossil fuel companies and asks for public participation in this complex subject [48]. As a comparison with Frick and Cirio, Ursula Endlicher develops *Light and Dark Networks (2020)* (figure 6) to show her concerns with climate change from both human and natural factors [13], [24]. Frick, Endlicher and Cirio have established an environmental narrative using data to question global capitalism and economics and its effect on the global. All these artists encourage people to think about their relationship with climate change and seek solutions. Moreover, through their creative art practice, they explain the causes of climate change and dialectically affect people and transform society through cultural transformation.



Figure 4: *What We Eat (2020)* by Laurie Frick.

Through collecting the carbon dioxide content data of each food eaten by thousands of people from the United States, France, and Britain, Frick converts these data into colourful patterns to and converts these data into colourful patterns to design this work.



Figure 5: *Climate Tribunal* (2021) by Paolo Cirio.

It is designed through interventions on canvas, fabric, and paper and features scientific and economic data, legal documents, and biological research.



Figure 6: *Light and Dark Networks* (2020) by Ursula Endlicher.

It shows two online “data performances” that change due to different artificial or natural parameters and transmit digital codes into materials such as spider’s web and mushroom.

Responding to climate change, Jer Thorp designed the *Herald/Harbinger* (2018) (figure 7) to illustrate the interrelationship between human activity in Calgary and the natural system of the Bow Glacier in the Canadian Rockies, and let people realize how close they are to the impact of the climate crisis [9], [29]. In 2017, hurricane Maria destroyed power supply

facilities in Puerto Rico, causing power cuts to at least 3.5 million people and about 3000 deaths. Based on this, Nathalie Miebach uses two narrative types from nature and human society in her work *The Burden of Every Drop* (2017) (figure 9), in which metaphor plays an important role. Through this work, Miebach explained the storm through materials, installation and colour that are not just visual but haptic, affecting the viewer through the senses [11], [44]. Thorp and Miebach combine art and other disciplines to explore materiality and a deepening people's understanding of climate change and its ecological issues.



Figure 7: *Herald/Harbinger* (2018) by Jer Thorp cooperated with Ben Rubin, Shah Selbe, and Dr Jeffrey Kavanuagh.

By using the same method as a cardioclograph to capture the sounds of the Bow Glacier to collect real-time data). Then, through algorithm coding, these data were visualized to create this public data sculpture.



Figure 8: *The Burden of Every Drop* (2017) by Nathalie Miebach. It combines weather and other numerical data with anecdotal information from news reports about the aftermath of the storm, displaying the impact of climate change on human society and survival.

Everything is interconnected, as Morton stated. Climate change is related not only to the present, but also to the future and the past (figure 9). *Deep Sea* (2011), created by Dr Kirell Benzi, shows the past history and envisages what the future will look like, thereby drawing people's attention to global warming [34]. Similarly, Cristina Tarquini's *Diving into an Acidifying Ocean* (2020) (figure 10) explores the impact of climate warming on marine organisms from the past to the future [20], [56]. Timo Aho, Pekka Niittyvirta's work *Coastline Paradox* (2020) (figure 11) talks about how cities, countries, and continents are being affected by global warming [19]. In a sense, these three works show the responsible practices of the creative and the use of art to transform through the aesthetic experience; art as an innovative tool with the function of education, communication, dissemination, and transformation, concentrating creative expression toward positive, creative speculative futures.

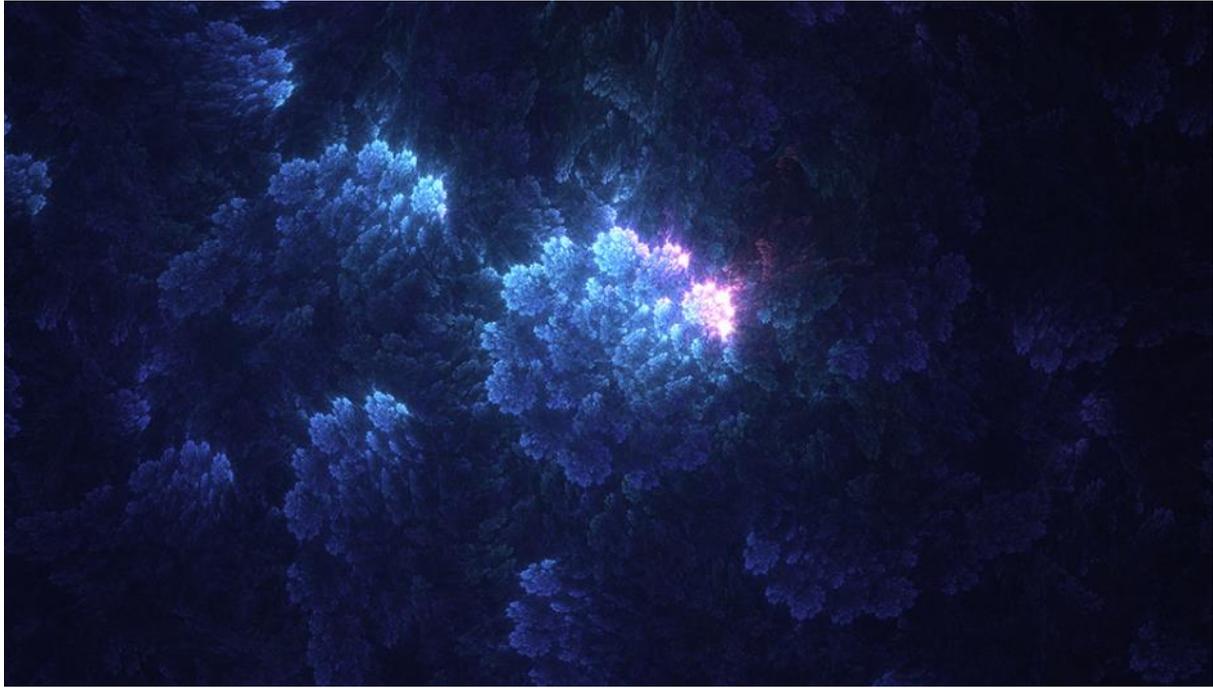


Figure 9: *Deep Sea (2011)* by Dr Kirell Benzi.
It uses algorithms to visualize the data of the sea level from January 1993 to April 2018, proving that global warming is not a theory but a real fact.

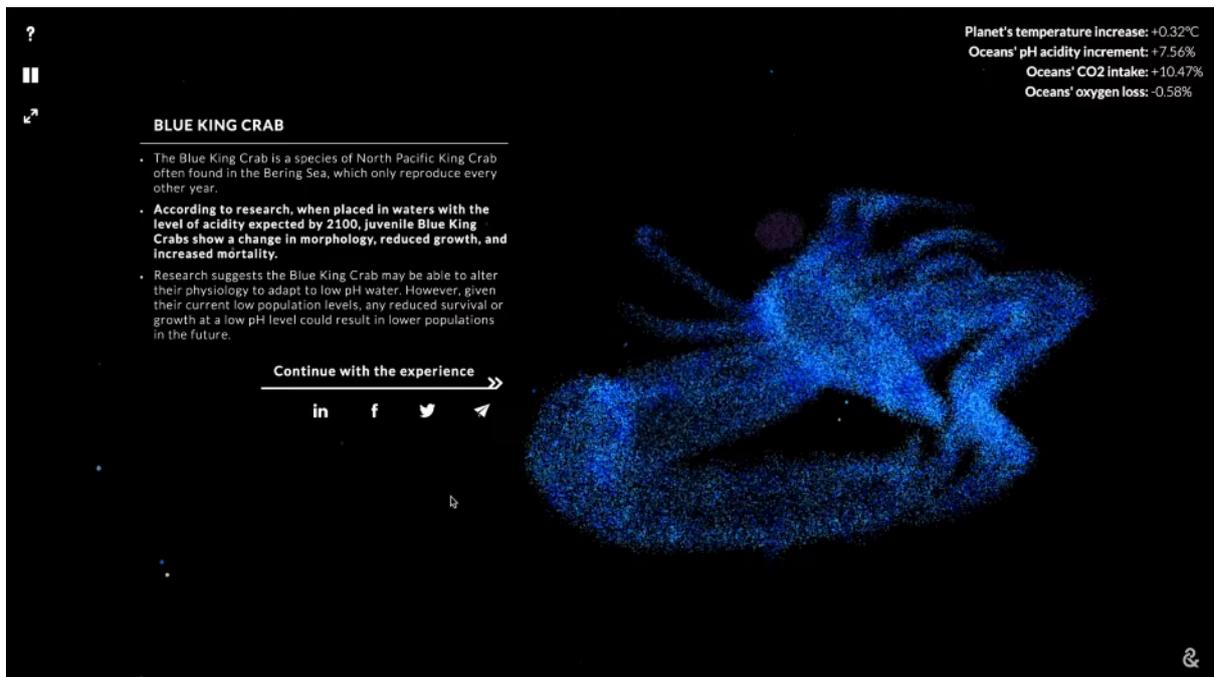


Figure 10: *Diving into an Acidifying Ocean (2020)* by Cristina Tarquini in collaboration with Google Arts & Culture, visualizing data obtained from the National Oceanic and Atmospheric Administration to explore the destructive impact of carbon dioxide levels on marine animals and species from before the industrial revolution to 2100, and a new marine organism born in the Anthropocene era.



Figure 11: *Coastline Paradox* (2020) by Timo Aho, Pekka Niittyvirta, in collaboration with Google Arts and Culture, Clare Brooks.

To fight against climate change, some artists use art to explore solutions. For instance, *88 cores* (2017) by Peggy Weil (figure 12) predicts future climate and environmental changes by detecting past climate and environmental changes [12], [47]. Moritz Stefaner's *Project Ukko - Climate service for seasonal wind forecasts* (2020) (figure 13) presents an understanding of the future variability of wind energy resources and bridges the gap between energy practitioners and the climate science community [50], [60]. In short, artists have integrated the concept of global thinking into art. Through art, they show a power beyond their survival essence, as well as a possible world and a speculated future.



Figure 12: *88 cores (2017)* by Peggy Weil. By using the data of ice cores collected in the National Ice Core Laboratory, drilled between 1989 and 1993 as part of the Greenland ice sheet project.

It emphasizes the key role of ice Nuclear Science in human exploration and understanding of the earth's past and future climate and tells people that human beings will coexist with climate change in the foreseeable future.

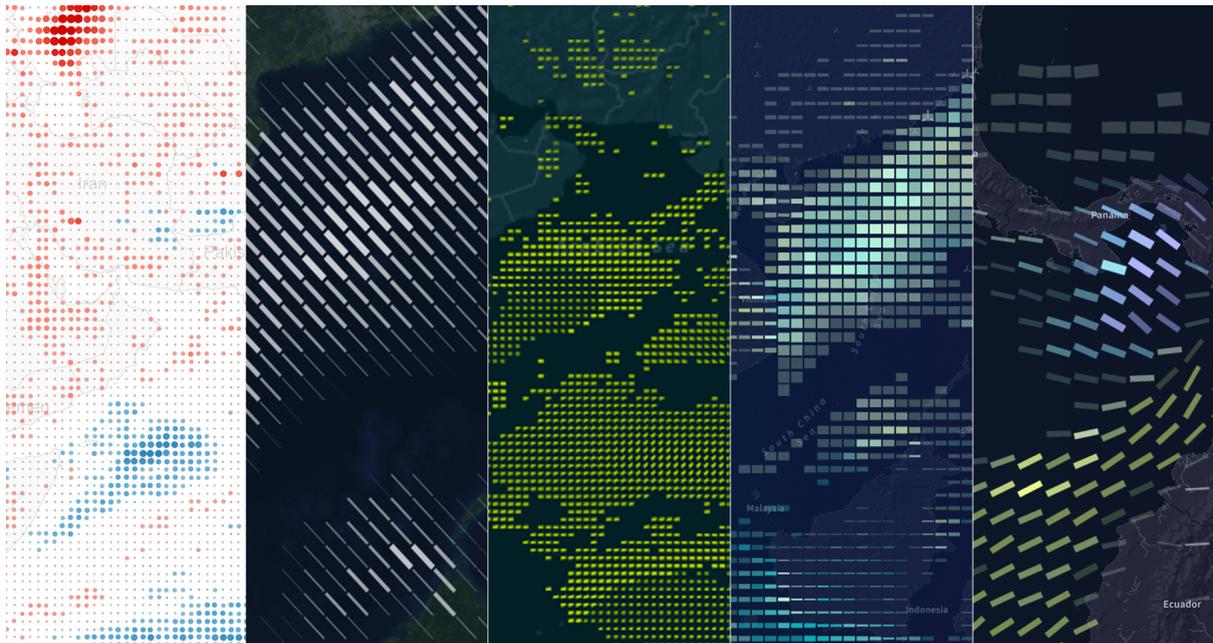


Figure 13: *PROJECT UKKO - Climate service for seasonal wind forecasts (2020)* by Moritz Stefaner.

He believes that both the natural environment and human society are vulnerable to climate change, and the progress of climate science is creating an unprecedented potential to provide longer-term climate and weather forecasts in the coming months, seasons, and decades.

This work is created for users in the wind power industry to explore the probabilistic wind speed prediction of future seasons provided by the resilience prototype.

3. Results and Discussion

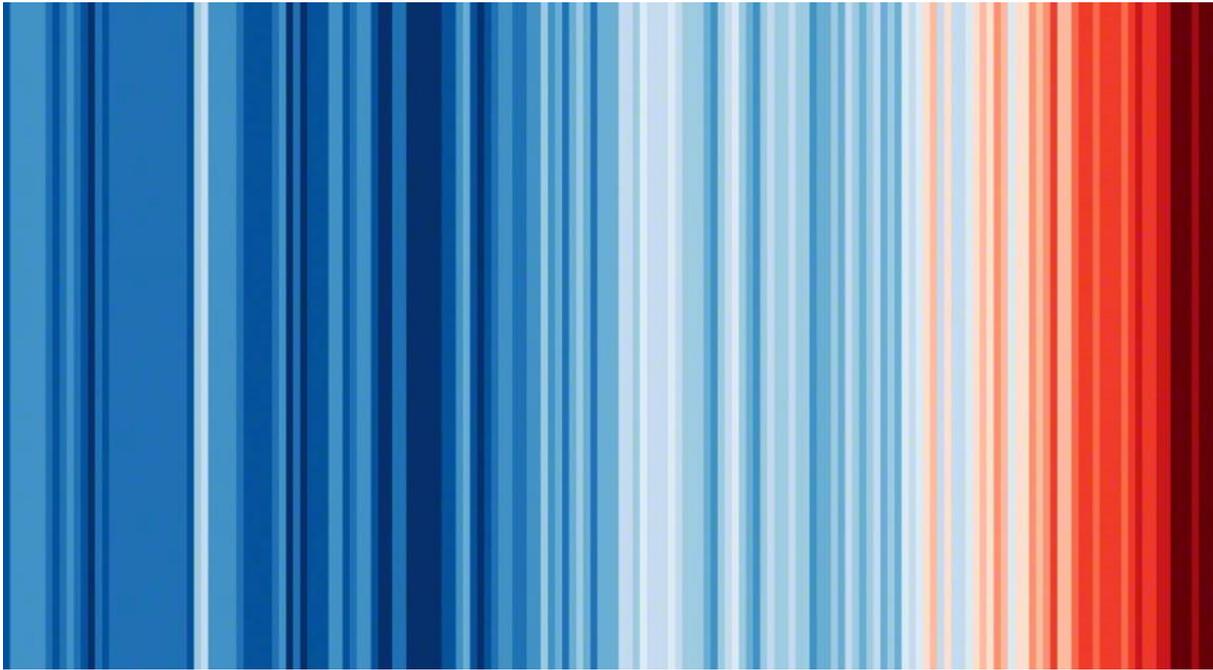


Figure 14: *Climate Stripes: Warming Stripes (2018)* by Ed Hawkins.



Figure 15: *Pollution Pods (2017-present)* by Michael Pinsky.

Climate Stripes: Warming Stripes (2018) (figure 16) and *Pollution Pods (2017-present)* (figure 17) are some of the projects that have made significant contributions to climate change in recent years [42], [53], [55]. This paper has brought together critical theory and contextual thinking within a visual framework. This method not only combines art with

interdisciplinary thinking to expand multi-disciplinary questions but further explores how visual and creative narratives and metaphors engender creative transformation in the space of climate change. The power of climate education is brought into play through artistic practice. Creative intention combined with specific climate issues integrates personal and collective emotion, transforming individuals and audiences and shaping sustainable thinking within global societies [59], [64]. In summary, art as an ideological metaphor and new approaches to narrative visual storytelling, when viewed through a methodological interdisciplinary lens, can deepen the understanding of climate change and form new insights and positive visualisation for speculative futures. Through art, artists can build imaginative spaces to rethink and refigure that contemplatively reimagine daily life, encourage people to reflect on their lives and behaviours and question their relationship to the planet, and the climate and promote sustainable values; integrating global thinking into art asks one to review the past, face the present and look forward to the future in the process of re-imagining and re-worlding to realize a sustainable and speculative future.

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References

- [1] Adorno, T.W. (1997). *Aesthetic theory* A&C Black.
- [2] Arts Council England. (2014). *The value of arts and culture to people and society – an evidence review*. Manchester: Arts Council England.
- [3] Arends, B. (2017). *Contemporary Art, Archives and Environmental Change in the Age of the Anthropocene*, .
- [4] aerocene.org. (2021). Museo Aero Solar. Retrieved from <https://aerocene.org/floating/>
- [5] Bloch, E., Plaice, N., Plaice, S., & Knight, P. (1986). *The principle of hope* (Vol. 3, pp. 1938-47). Cambridge, MA: Mit Press.
- [6] Bloch, E. (2022). *The spirit of Utopia*. In *The Spirit of Utopia*. Stanford University Press.
- [7] Villeneuve, D., Gosling, R., & Ford, H. (2016). *Blade Runner 2049*. Alcon Entertainment.
- [8] Cape Farewell. (2013). *Carbon 14: Climate is Culture*. Retrieved from: Carbon 14: Climate is Culture – Cape Farewell
- [9] Curtis, D. (2006). Mobilising rural communities to achieve environmental sustainability using the arts. *Greek Association of Agricultural Economists*, 7(1), 15-25. doi:10.22004/ag.econ.44103
- [10] Curtis, D. J. (2009). Creating inspiration: the role of the arts in creating empathy for ecological restoration. *Ecological Management & Restoration*, 10(3), 174-184.
- [11] CIRCA Art Actuel. (2018). *The Burden of Every Drop*. Retrieved from <https://circa-art.com/en/exhibitions/the-burden-of-every-drop/>
- [12] Colby College Museum of Art. (2019). *88 Cores*. Retrieved from <https://museum.colby.edu/exhibition/peggy-weil-88-cores/>
- [13] Chronus Art Centre. (2021). *Light and Dark Networks*. Retrieved from [light and dark network \(chronusartcenter.org\)](http://lightanddarknetwork.org)
- [14] Dieleman, H. (2008). Sustainability, art and reflexivity. *Sustainability: A new frontier for the arts and cultures*, 108, 146.
- [15] Dewey, J. (2005). *Art as experience*. Penguin.
- [16] Eve S. Mosher. (2021) *HighWaterLine*. Retrieved from <https://www.evosmosher.com/highwaterlin>
- [17] Gilmore, A. (2014). *Raising our quality of life: The importance of investment in arts and culture*. London: Centre for Labour and Social Studies.

- [18] Google Arts and Culture. (2020). What We Eat. Retrieved from <https://experiments.withgoogle.com/what-we-eat>
- [19] Google Arts and Culture. (2020). Coastline Paradox. Retrieved from <https://experiments.withgoogle.com/coastline-paradox>
- [20] Google Arts and Culture. (2020). Diving into an Acidifying Ocean. Retrieved from <https://experiments.withgoogle.com/diving-into-an-acidifying-ocean>
- [21] Han, J.X. (2010). Debate On Ernst Bloch's Philosophy of Hope. *Inheritance*, (10), 40-41.
- [22] Hai, L.B. (2011). A study of aesthetic cognition from the perspective of Art Anthropology. *The Ideological Front (Yunnan University's Journal of Social Sciences)*, (5), 6-10.
- [23] HINT.FM. (2021). Wind Map. Retrieved from <http://hint.fm/projects/wind/>
- [24] HEK. (2021). Ursula Endlicher – Light and Dark Networks. Retrieved from <https://www.hek.ch/en/program/events/ursula-endlicher---light-and-dark-networks>
- [25] Izard, C. E. (2013). *Human emotions*. Springer Science & Business Media.
- [26] Isaac, R.K. (2015). Every utopia turns into dystopia. *Tourism Management*, 51, 329-330.
- [27] Invisible Dust. (2016). Kasia Molga – Human Sensor LDN. Retrieved from <http://invisibledust.com/project/kasia-molgas-human-sensor-project/>
- [28] IPCC, 2018: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.
- [29] Jer Thorp. (2018). Herald/Harbinger. Retrieved from <https://www.jerthorp.com/herald-harbinger>
- [30] Jónsdóttir, Á.B. (2017). *Artistic actions for sustainability: Potential of art in education for sustainability*. Lapland University Press.
- [31] John Sabraw. (2021). *Art + Science*. Retrieved from <https://www.johnsabraw.com/research>
- [32] Kagan, S. (2014). *Art and sustainability: Connecting patterns for a culture of complexity (Vol. 25)*. transcript Verlag.

- [33] Keller, A., Sommer, L., Klöckner, C. A., & Hanss, D. (2020). Contextualizing information enhances the experience of environmental art. *Psychology of Aesthetics, Creativity, and the Arts*, 14(3), 264.
- [34] Kirell Benzi. (2018). Deep Sea. Retrieved from <https://www.kirellbenzi.com/art/deep-sea>
- [35] Li, S. (1988). The description of aesthetic psychology in the process of artistic creation. *Tangdu Journal*, (4), 29-35.
- [36] Levitas, R. (2010). *The concept of utopia* (Vol. 3). Peter Lang.
- [37] Laurie Frick. (2020). What We Eat. Retrieved from <https://www.lauriefrick.com/what-we-eat>
- [38] Morton, T. (2010). *The Ecological Thought*. Harvard University Press.
- [39] Morton, T. (2013). *Hyperobjects: Philosophy and Ecology after the End of the World*. U of Minnesota Press.
- [40] Mei, X.Q. (2014). Lessons learned from developed countries. *Social Outlook*, , 31-33.
- [41] Moldavanova, A. (2014). Sustainability, aesthetics, and future generations: Towards a dimensional model of the arts' impact on sustainability. *Transitions to Sustainability: Theoretical Debates for a Changing Planet*, , 172-193.
- [42] Michael Pinsky Studio (2019). Pollution Pods. Retrieved from <https://www.michaelpinsky.com/portfolio/pollution-pods-2/>
- [43] MoMA. (2021). Wind Map. Retrieved from <https://www.moma.org/collection/works/163892>
- [44] Nathalie Miebach. (2018). The Burden of Every Drop. Retrieved from Nathalie Miebach: sculpture (Accessed: 2021/05/10)
- [45] Polli, A. (2004). Atmospherics/weather works: A multi-channel storm sonification project. Georgia Institute of Technology.
- [46] Peng, L.H. & Zhang, C.M. (2009). On the relationship between art and Science. *Keji Jingji Shichang*, (3),101-102.
- [47] Peggy Weil Studio. (2017). 88 cores. Retrieved from <https://pweilstudio.com/project/88-cores/>
- [48] Paolo Cirio. (2021). Climate Tribunal. Retrieved from https://www.paolocirio.net/press/texts/text_climate-tribunal.php
- [49] Pitt, C. (2019). The Effect of Art and Science in Shaping Attitudes Towards Climate Change, .

- [50] Project Ukko. (2020). Project Ukko - Climate service for seasonal wind forecasts. Retrieved from <https://project-ukko.net/>
- [51] Resch, R.P. (1997). Utopia, dystopia, and the middle class in George Orwell's Nineteen Eighty-Four. *Boundary 2*, 24(1), 137-176.
- [52] Reflik Anadol Studio. (2021). Wind of Boston: Data Paintings. Retrieved from <https://refikanadol.com/works/wind-of-boston-data-paintings/>
- [53] Somerset House. (2018). An installation by artist Michael Pinsky made up of five geodesic domes, emulating polluted environments in cities globally. Retrieved from <https://www.somersethouse.org.uk/whats-on/michael-pinsky-pollution-pods>
- [54] Swanborough, J. (2019). 6 things we learned about the environment at Davos 2019. Retrieved from <https://www.weforum.org/agenda/2019/01/the-environment-was-high-on-the-agenda-in-davos-but-what-actually-happened/>
- [55] 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*, 59, 101992.
- [56] Studio Crtq. (2021). Diving into an Acidifying Ocean. Retrieved from <https://www.studiocrtq.com/acidifyingocean>
- [57] Saraceno, T., Engelmann, S. and Szerszynski, B. (2015). Becoming aerosolar: From solar sculptures to cloud cities. *Art in the Anthropocene*, , 57-62.
- [58] Studio Tomás Saraceno. (2021). Museo Aero Solar: for an Aerocene era. Retrieved from <https://studiotomassaraceno.org/>
- [59] Tao, Y. (2010). On Aesthetic Experience. *Golden Times*, (10), 176.
- [60] Truth & Beauty. (2020). Project Ukko - Climate service for seasonal wind forecasts. Retrieved from <https://truth-and-beauty.net/projects/ukko>
- [61] UNDP. (2014). Human Development Report 2014: Sustaining human progress: Reducing vulnerabilities and building resilience. New York: The United Nations Development Programme (UNDP).
- [62] United Nations Sustainable Development. (2019). Goal 13: Take urgent action to combat climate change and its impacts. Retrieved from <https://www.un.org/sustainabledevelopment/climate-change/>
- [63] World Meteorological Organization. (2019). State of the Climate in 2018 shows accelerating climate change impacts. Retrieved from <https://public.wmo.int/en/media/press-release/state-of-climate-2018-shows-accelerating-climate-change-impacts/>

[64] Zong, W.X. (1992). Expression of art emotion. *Journal of Northwest University for Nationalities: Philosophy and Social Sciences*, (3), 101-109.