James Wyness

if we do nothing

The Sonification of Climate Change Data

In Naomi Klein's bestseller This Changes Everything, the author talks of her initial inability to respond to climate change, to stand up and take positive action. Many of us share her frustration in the face of an apparently hopeless situation. How can we in the relatively affluent West respond to something which seems to exist as a vague irritation, an occasional media headline, something which requires substantial investments in time and energy to understand the implications of visual data?

if we do nothing, a multi-partnership project, is one such response. The project is underpinned by scientific and anthropological understandings of climate change data and environmental knowledge. Climate change data are investigated by means of sonification models. These models represent data using sound - in this case the models explore innovations in pulsar and speech synthesis, offering challenging yet accessible sound installations which, in exploiting sound's potential to offer a more readily perceptible representation of the data, invite fresh perspectives and perceptions with respect to our understandings of anthropogenic climate change.

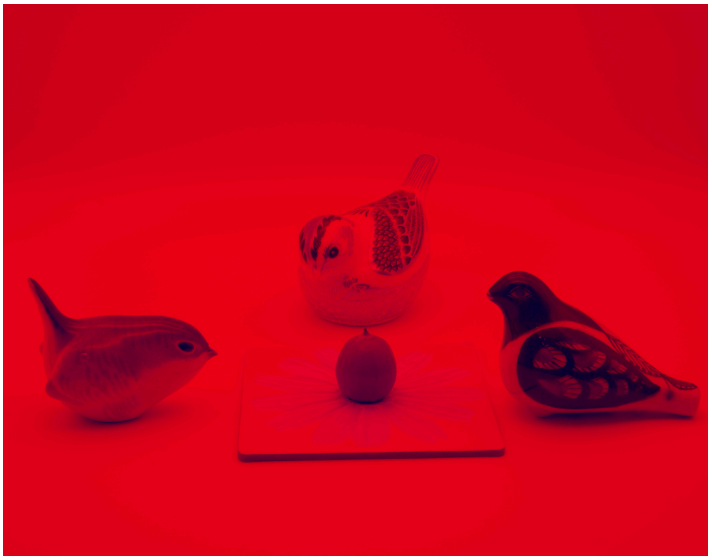
The project began as a simple concept born of my inabilty to make sense of the endless streams of visual data on climate change. I had the idea to sonify the data. The dynamics of climate change's various drivers, for example rising CO2 or disappearing Arctic sea ice, would be represented in sound. I wanted to exploit sound's advantages over forms of visual representation, principally its potential to afford immediate transformational experiences. Sound, as a phenomenological reality-in-itself, invites audiences to feel the movement of data, offering unique perceptions of the abstract complexities of climate change data. The more I looked into developing global scenarios the more I understood that human induced climate change is a civilisational problem and that the artistic community is as well placed as any to generate fresh thinking. I came to appreciate the differences between strictly media-specific arts (I myself work almost uniquely with sound) in their largely self-enclosed modes of production and presentational forms, and the contemporary eco-arts, including art/science collaborations, which thrive on complexity and transdisciplinarity, often oblivious to the imperatives of the established art world. My research brought me face-to-face with current lines of enquiry into adaptation, sustainability, the fragmentation of knowledge, the conditions and limits of science and the importance of artistic endeavour in reframing the important questions. In these respects the project was both refreshing and edifying.

Model 1

I looked at four sonification models, beginning with ‘big data’, representations of rising global CO2 and falling glacier mass (Switzerland’s Aletsch Glacier). Scientists rarely admit to a simple relationship between the two phenomena, that global warming causes falling glacier mass, but many of us sense that the relationship is there and very real. Proving it conclusively is very difficult. Perhaps this allows the deniers room for manoeuvre. Data monitoring for both phenomena goes back some time so I chose 1880 as a starting date, when effects of the industrial revolution kick in. I took forward projections to 2050, when tipping points are predicted to cause chaotic or irreversible conditions. Working with composer and programmer Shelly Knotts, who brilliantly managed the fearsome task of mapping and scaling the data, my initial model, using glissandi (sliding tones), ran into a few problems. The concept was very simple. I wanted two tones to begin at the same frequency, then to diverge, scaled and mapped to the rising and falling data, so that the glacier data eventually descended into the subsonic and the CO2 data rose likewise beyond human hearing. This would eventually run for upwards of an hour, maybe even a whole day, a month, a year (depending on the ambition of a curator). I wanted all the noisy interactions between the slowly diverging tones to manifest themselves (mirroring the complexity and chaotic interferences of the real-world phenomena) and, as the frequencies reached their high and low points, to generate difference and combination tones which would offer an analogue to the predicted tipping points. I still believe that this can be done successfully but I need to work with a programmer who can make the timbres both interesting to the ear and flexible enough to interact successfully as they move through time and space. I therefore set this model aside and, with specialist assistance from composer, software designer and researcher Marcin Pietruszewski, looked instead at pulsar synthesis, an exciting research field in contemporary electronic music. As the name implies the sounds are small pulses or ticks, each with an element of pitch embedded in them. The speeding up and slowing down of the ticks offers a robust and, I would suggest, convincing representation of the two data sets, one mapped to rising CO2 levels (the speeding up), the other to glacier ablation (the slowing down). The synthesis modules were coded to produce almost infinite variations of the model, as well as a suite of choices with respect to duration and other parameters. An interesting extension of this research is that pulses can make speaker cones activate surfaces such as drumskins, which led me to some initial investigations into working with transducers and frame drums.

Model 2

Next I developed a model exploring the phenomenon of disappearing Arctic sea ice. One of my original ideas had been to create a permanent fixed installation that would sonify real-time (or near real-time) data. My cryosphere colleagues gently (but firmly) convinced me that this would be impossible because the changes are too slow to be perceived on scales of less than a decade. We agreed eventually on the idea of investigating Arctic sea ice. There seemed to be general agreement that of all the phenomena marking change in the Arctic, all the data, local knowledge and simple observations from sustained field work points to the rate of loss of Arctic sea ice as the most obvious and critical. Revisiting the method of taking historical data and projecting forward using best estimates, I gathered data mapping the disappearance of sea ice from 1980 (earliest records) to 2080, when some scientists predict it will have disappeared altogether. The model uses two tones, high and low, representing ice levels a century apart. A sweeping tone between the two at a user-defined interval emphasises the difference. The simplicity of this model honours a fundamental principle of sonification.



Model 3

With large-scale research projects like this, with its detours and distractions, I was drawn to a consideration of adaptation from the perspective of indigenous communities living in and around the Arctic rim. With advice from anthropologists and climate scientists at the University of Aberdeen I learned that many such communities, though at great risk from the effects of climate change, are arguably better prepared, culturally and historically, than urban Europeans for example, to adapt to and survive the worst effects. This led me to examine the knowledge systems, myths and stories of communities living in the North American and Siberian arctic regions. I provided a colleague specialising in these languages, Italian composer, linguist and researcher Giancarlo Toniutti, with specific 'semantic fields', key words and concepts around environment, weather, migration and so forth. He in turn provided me with native language texts, pronunciation notes and translations. After some time spent learning details of pronunciation and intonation, I read and recorded both originals and translation. My recorded voice was synthesised and transformed by Marcin Pietruszewski using customised software. Next I looked at the UN literature for what I'd call 'authoritative' texts, related as far as possible to the themes of the indigenous texts. These procedures led me to the largely epistemological or even ethnographic problem of the incommensurability of world views, the porosity of knowledge, for example the differences between Western science (logos) and myth (mythos) in defining and explaining the universe. I took the view that indigenous environmental knowledge, often inscrutable, irrational or non-rational, is itself a form of data (data = something given). An initial piece for radio, The Earth Appeared, was composed from various sound sources - field recordings, official UN statements on climate change, synthesised voices (based on my own voice) reading excerpts from the oral histories of Arctic communities, with translations, and interviews about how climate change might affect future soundscapes. The piece serves as a draft for a multi-channel immersive work based on four bodies of text.

wé sít'
ùn yù xh'adudli.átk,
khà xh'aya.áxhch yû has xh'ayakhá,
wé Nàda.êyàch tsu àxh dàk wułłàyí yîyich
á àxh áwé has awsikû.

the glacier
could be spoken to
and it would understand what it was told, they said,
because Nàda.êyà the ice receded, melting away from it.
This is how they knew about it.

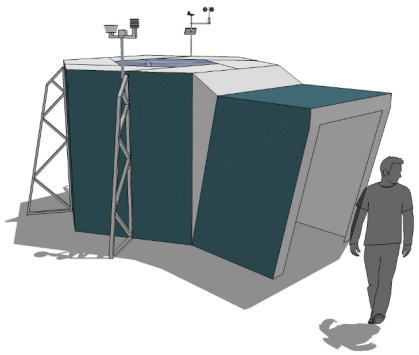
(from Elizabeth Nyman and Jeff Leer, Gágiwdul.àt: Brought Forth to Reconfirm. The Legacy of a Taku River Tlingit Clan)

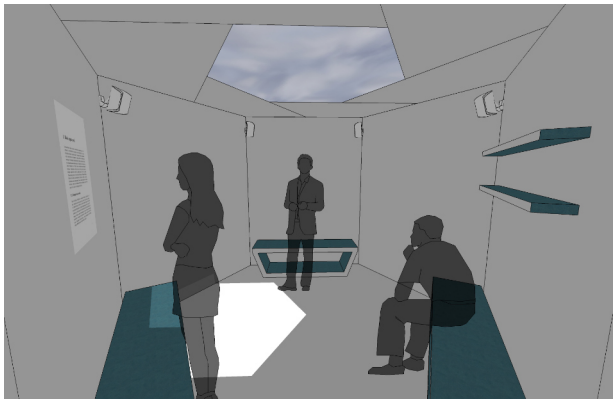
Model 4

My fourth model takes me to (near) real-time data sonification which is something I still want to develop and produce. Where I live, in the semi-rural Scottish Borders, the air is assumed to be relatively clean compared to the cities, for reasons more or less obvious. I began looking at ways of gathering, contrasting and sonifying air pollution data from both rural and urban monitoring sites. To complicate matters the rural air is often heavily polluted as a result of proximity to methane sources (livestock) and drifting pollutants from continental Europe. My hope is that this localised model will ground the debate, drawing in people and communities, fostering discussion around local transport, food production, housing, land use, sustainability and adaptation. I also looked into river level monitoring and the idea or concept of creating sonic warning mechanisms to alert people to possible flood conditions, an undertaking that includes gathering stories from land and river workers around ad hoc adaptations to local effects of climate change. Perhaps one day soon these things will become important enough for arts and other organisations to look seriously at such projects.

Listening Pavilion

As part of the funding from Creative Scotland, and bearing in mind the importance of public engagement in the project, I commissioned a design brief for a pavilion that would eventually house the sonification model. This pavilion references two traditions of Arctic architecture, the climate research station and the igloo. It provides an enclosed listening space with loudspeakers, seating for four or five people, wall and shelf space for interpretation and documentation. The pavilion is designed to serve as either as a fixed permanent installation or a touring structure. As a fixed structure it would host the near real-time model described above and function as a multi-purpose listening booth, to present not only my own work but also that of others exploring similar concepts and themes. It's of a size to work as a mini gallery, chat room or library. The touring structure is modular and more versatile. The siting and building of this beautiful structure awaits sponsorship or funding. To this end welcome partnerships with venues, curators and funders who might want to collaborate on developing an aspect or aspects of this project. I welcome any contact and will be happy to provide further details.





Testing and Evaluation

The first model was tested at the Sound + Environment conference at the University of Hull in July 2017. A short version of model 2 was tested and evaluated at the 2017 Balance-Unbalance conference held at Plymouth University (UK) in August 2017.

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