

# Culture and Climate Change: Scenarios

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# Culture and Climate Change: Scenarios

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Renata Tyszczyk and Joe Smith have previously written about the *Scenarios* project in an article: 'Culture and climate change scenarios: The role and potential of the arts and humanities in responding to the "1.5 degrees target"' *Current Opinion in Environmental Sustainability*, (2017) and in a book chapter: 'Culture and Climate Change, Experiments and Improvisations – An Afterword' in G. Feola, H Geoghegan and A. Arnall (eds.), *Climate and culture: Multidisciplinary perspectives on a warming world* (Cambridge University Press, 2019).

This publication is the third in the series of Culture and Climate Change books. The resources in this publication, including the bibliography, are intended to be concise. It is worth emphasising that the publications and our other activities are intended to inhabit a middle ground between the academic and creative worlds, and hence while we aim to respect scholarly conventions in the essays we do not want to be ruled by them. The referencing is lighter than is typical in academic journal articles, and the writing styles and voices more diverse. We much appreciate the support of Katrina Zaat, who has served as copy-editor for this publication.

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Renata, Joe and Robert

# Climate change is a scenario

# Introduction

Climate change is a scenario. It is a scenario that simultaneously conjures up visions of an uninhabitable earth, unimaginable societal transformations, future extinctions and expulsions. It summons authoritarian technofixes and existential crises. It backtracks and fast-forwards searching for patterns and trajectories. It tracks the convulsions of a restless earth and proposes monstrous solutions. In different hands it becomes a mandate for taking back control (of the planet), or an argument for giving up, or a motive for trying to leave entirely. Yet climate change as an idea is at the same time an invocation — a holding out hope for a better world. It wants to think the future otherwise. It has inspired a multitude of speculative fixes — Plans B through Z, and beyond. It is many possible scenarios. It is many contradictory possible futures.

Scenarios are a common method of getting a better grip on the future, particularly when the future is understood to be in crisis. Indeed, resorting to scenarios has become an indispensable means to hypothesize upon, imagine, and design for uncertain futures in unsettled times. Scenarios are applied in the risk and foresight industries; in climate modeling, including the science-policy interface of climate science; in contingency and adaptation planning for urban futures; in the backcasting and forecasting work of business trend watching; in speculative design practices that try to anticipate future lifestyles; and in the catastrophic (for the most part) imaginings of climate fiction. Scenarios (especially the nightmare ones) have also informed the ‘wake-up’ calls demanding action from Greta Thunberg and Extinction Rebellion.

Through an engagement with scenarios, this book draws attention to the fact that climate change has a wider cultural significance, and deeper reach, than research and policy discourses generally tend to recognise. As we have stressed in the two previous books of essays in this series, climate change research is *difficult new knowledge*. It introduces complexities, anxieties and new questions into many areas of life. This volume focuses on climate change scenario-building as a kind of story-making — and argues for the importance of stories and speculative fictions in envisaging climate futures. It also opens up another route to understanding the narratives that underpin economic and political systems, catalysing business ventures and forging international legislation.

There has been a tendency for the research and policy community to treat the communication of climate change as a demanding but simple problem of ‘getting the message across’. This seems to us a blunt foreshortening of potential public engagement with this challenging area of knowledge. Current demands and warnings from experts have arrived prepackaged, as it were: consumable catastrophes for a passive, frightened and stubborn public. One very persistent tactic deployed at the join between research, political and media worlds has been to work off summary numbers: degrees; years; months. ‘We have this long to achieve this much’. In the period since the last IPCC report these techniques for connecting the future to present action have gathered momentum. In tandem with civil society responses, including widespread ‘school strikes’, these number games have seen many institutions declare Climate Emergency. This has included the cultural sector. What does it mean for culture to declare an emergency? What is the motive force behind this? What is the exact nature of the jeopardy?

The conditions that are required for a fuller public engagement with climate change — one in which the public might be invited to take part in changing the narrative, rather than just consuming or denying it — are complex. This makes it an important time to think even more carefully about the stories that are told about climate change, and the politics of knowledge that surrounds it. Our previous publications have proposed that the achievements of the United Nations Framework Convention on Climate Change (UNFCCC) processes need to be acknowledged, and responded to in more meaningful ways than just hastily borrowing headline-ready targets and deadlines. Artistic and cultural work that responds to climate change is becoming more ambitious in its aims not just to restate the crisis, but to encourage societies to respond dynamically and pluralistically to it. There is a growing awareness that culture is not merely a bystander-witness to anthropogenic climate change, for nothing human-driven occurs outside of culture. This also makes culture a site of potential resistance and reframing. We see significant opportunities in supporting more purposeful exchanges between cultural production and the worlds of research, policy and politics. This volume of essays centres on one of the areas we identify as holding particularly rich and constructive potential: climate change scenarios.

Although scenarios have played a prominent role in climate research, policy and communication, they have tended to be dominated by the scenario techniques of natural science and economics. Our hunch is that when scenarios are more broadly understood as ‘transformative stories’ they can do much more. Our ambition has been to experiment with ways of bringing greater cultural depth to public conversations about future climate scenarios.

This publication is the third in the Culture and Climate Change series of ‘pocket books’: portable, accessible, malleable and provisional guides to the uncertain but rich terrain of climate change. In 2011 we published the first volume, *Culture and Climate Change: Recordings*, based on a series of panel discussions on the history, publics, anatomy and futures of climate change. The second volume of essays, *Culture and Climate Change: Narratives* appeared in 2014. Along with associated events and podcasts, the book reflected further on the kinds of stories that are already being told, and asked what new narratives about climate change might need to be nurtured.

This new volume of essays and reflections picks up the story from the UNFCCC COP 21, held in Paris in December 2015. It was at this event that the *Culture and Climate Change: Scenarios* project was launched. The project was a response to calls for humanities and social science scholarship to engage with the institutions and practices of global environmental knowledge-making.

The project had two strands, which partly overlapped. In the first, it convened a community of researchers interested in climate change scenarios from across a broad range of disciplines, including relevant professional experience from the arts, industry and policy. The second strand piloted a new model of arts-research residency — a ‘networked residency’, which both thematised and made use of the distributed-but-interconnected nature of climate research. The artists who took part in the year-long residency, between July 2016 and June 2017, were challenged to open up thinking on climate scenarios in the wake of the Paris Agreement that emerged from COP 21.

The *Culture and Climate Change: Scenarios* publication collects responses to scenarios of climate change from some of the contributors to the seminar series that formed part of the project. It provides accounts of the Culture and Climate Change residency programme, as well as diary extracts from the artists that recount their experiences of exploring and developing scenarios. The book also includes a series of shorter essays from across the network of climate researchers. Together these contributions invite further transformational thinking on unpredictable climate-changed futures. Our hope is that this kind of thinking can help to animate careful but purposeful action. After all, when we generate scenarios we are asking ourselves what kind of future do we want.

Renata Tyszczyk, Joe Smith and Robert Butler

# Five essays



## A Brief History of Scenarios

Renata Tyszcuk

Of the Earth, the present subject of our scenarios, we can presuppose a single thing: it doesn't care about the questions we ask about it. What we call a catastrophe will be, for it, a contingency (Stengers, 2000).

The Earth doesn't care. To reflect on 'catastrophic times' (Stengers, 2015), through scenarios is to be unsettled by humanity's power to disrupt and also by its vulnerability to disruption. Yet scenarios are also stories of change and are understood as a way of coming to terms with and apprehending catastrophe. Indeed the preeminent scenario for our troubled times has been the Anthropocene – with its world-ending warnings and its undermining of everything the *anthropos* has ever stood for. Faced with a world falling apart, 'it matters what stories make worlds, what worlds make stories' (Haraway, 2016). The way a society imagines its future matters, and who gets to do the imagining matters. Tracing the history of scenarios is part of an effort to understand the authoritative status of scenarios within formal climate change research and policy processes as well as their ubiquity in narratives that underpin our economic and political systems. But it is also an attempt to place this practice of 'future making' in its wider cultural context and to reveal the potential of scenarios as transformative stories. Scenarios are proposed as a way of 'thinking the future otherwise' in conditions of planetary turmoil and unsettlement. Indeed, scenarios are configured around the question: *what if?* Paying attention to scenarios might help in finding ways of not leaving the future to take care of itself and offer insights into shared practices of taking care of the future.

### Improvising for the Unforeseen

The origins of 'scenarios' lie in the theatre. Scenarios were the synoptical collages of the actions, intentions, emotions and use of props in a play or opera, usually associated with the improvised performances of *commedia dell'arte* (or *commedia all'improvviso*) – a form of sixteenth century Italian street theatre. The performers usually played on temporary outdoor stages, and relied on a few makeshift props to evoke places and situations. At the heart of *commedia dell'arte* practice was the decision to dispense with a full written script and to construct performances around a *scenario*. The *scenario* was typically a rough outline describing the plot of a play, jotted down on a scrap of paper and literally pinned up backstage, behind the scenery (Andrews, 2008). It was thus also known as *canovaccio*, or 'that which is attached to the canvas', of which the scenery was usually constructed. In addition to the location of the play, almost always a specific city, the scenario included a list of characters (Arlecchino, Pantalone, Capitano, etc.), grouped in households and relationships, and a list

of the necessary props and costumes (*robbe per la commedia*). This was followed by the action of the scenario, scene by scene, including entrances and exits, over three acts. During the performance, the skeletal framework of the story, presented in the scenario, was fleshed out through improvisation. *Commedia dell'arte* was thus principally an *actor's* theatre rather than a dramatist's theatre. Scenarios were a prompt to performances that responded to the cities they were set in and performed in, and to the complexities of everyday life, thus revealing the relations, emotions, values and motives of society. Perhaps most importantly however, the scenarios of *commedia dell'arte* left room for the surprising and the speculative. By being placed firmly in the everyday, and through their cross-cutting and subversive use of genres and rhetorical devices, the improvised performances had much in common with the skeptical, parodic, ironic and carnivalesque that questioned authority, prescribed pathways and pre-ordained futures. The interest here is not in theatrical genres per se but in the idea of *improvisation* – which has at its root the latin word *improvisus* meaning 'unforeseen'. The intellectual history of the idea of improvisation goes back to Aristotle's 'practical wisdom' or *phronesis*, that is, the ability to respond to unforeseen situations (Tysczuk, 2011). These are situations in which there is no set idea or precedent to work from – in other words, where there is *no script for action*. Practices of improvisation might help us to respond to whatever the world throws at us and grasp a future we can't imagine.

### **In unsettled times, how can scenarios help prepare us both practically and imaginatively for the unforeseen?**

#### **Thinking the Unthinkable**

For a recent account of unsettled times, we might look to the Cold War. This period was marked by widespread societal anxiety about the world ending, and the corresponding development of an elaborate apparatus of emergency. This included: the setting up of the first 'think tank', the RAND corporation (which stood for 'Research ANd Development' of military strategy) in 1948; the development of emergency scenarios; the founding of new proving grounds and test sites for warfare and civil defence; the widespread diffusion of surveillance technologies by the military-scientific complex; and the establishment of regimes of urban securitization in the name of preparedness for nuclear disaster. Doomsday might be approaching, but at least you could be ready for it.

In the early days of Hollywood, the word *scenario* had migrated from theatre and come to refer to screenplays. But in the 1960s the word was borrowed from the entertainment industry to describe the strategic planning techniques for nuclear warfare developed by Herman Kahn. The inspiration for Kubrick's infamous *Dr Strangelove*, Kahn worked at RAND with a team of strategists and storytellers, including Hollywood screenwriters. His scenarios combined game theory, nuclear war strategy and systems theory, and involved writing multiple

histories of the future – or what he called the 'Future-Now'. These combined detailed analyses of contemporary concerns and trends with imaginative storytelling. Kahn's futures included the evaluation and selection of the most and least desirable futures – or 'best-case' and 'worst-case' scenarios – in the event of a hypothetical nuclear war – the 'unthinkable'.

Kahn's compendium of scenarios, *On Thermonuclear War*, was published in 1960. The book collects matter-of-fact calculations, graphs and data on the effects of global nuclear cataclysm, including large-scale human casualties (or 'megadeaths', as he called them), the genetic effects of radiation, and protracted periods of recovery. Kahn's storytelling impulse ranged from quirky asides on the 'unthinkable', such as nausea epidemics, through to detailed analyses of the imagined pageantry of World Wars I through VIII. Kahn's response to the widespread anxiety about possible world annihilation was a rational, calm and informative description of exactly what nuclear cataclysm might look like – as well as an assessment of the prospects of humanity in its aftermath.

A journalist remarked at the time, 'Herman Kahn may feel that, by inventing one scenario after another, he is holding back the changes that would seal our doom' (cf. Gamari-Tabrizi, 2005; p. 204). One of Kahn's favourite books was *A Thousand and One Nights*, a classic of nested storytelling, and Kahn considered his scenarios 'modern-day myths': a compelling way to demonstrate threats and opportunities, as well as a means of anticipating them. Like the fairy tales and cautionary tales of folk literature, scenarios could warn their audience of danger over and over again, and, as Kahn pointed out, they could also reassure: 'Remember, it's only a scenario' (Kahn, 1979; p. 112). In the scenario planning techniques established by Kahn, there were myriad possible scenarios. Anything could happen in the future and the synthetic storytelling inherent in such scenarios was open as much to 'bizarre crises' (in Kahn's terms) as it was to alternative pathways. The endless iteration of multiple storylines fanning out from the present held open the possibility – hopeful yet threatening – that one of them *might just turn out to be true*.

### **Scenarios were deemed capable of relating unstable situations to both unthinkable consequences and possible alternative futures. But to what end?**

#### **World Limits**

The doomsday scenarios developed at RAND were not limited to nuclear catastrophe. The connections explored between national security and the Earth's vulnerability included dire warnings of population pressure, environmental degradation, and the spread of disease. The scenario method was also deployed in the Club of Rome-sponsored *Limits to Growth* (1972) – the so-called 'doomsday report' – which was hastily published in time for the UN Stockholm Conference of the Environment in 1972 – the first 'Earth Summit'. This event, considered a landmark in the history of environmental politics, was the occasion

through which the UN set the international institutional framework and standards for managing the 'whole earth'. The framework comprised a suite of systems-based ecological paradigms, monitoring networks, and scientific stewardship. The aspiration was to establish a semblance of certainty in the midst of uncertainty.

The data-driven agenda is encapsulated in the *Limits to Growth* report, which brought to prominence the use of computer simulation scenarios using feedback-based 'world models' as a mainstay of policy-making, in spite of their scary predictions and shaky prognostics. The systems dynamics WORLD3 model discussed in the report had built on Jay Forrester's WORLD1 and WORLD2 computer models, published as *World Dynamics* (1971) and based on his 1969 study of cities, *Urban Dynamics*. Forrester had scaled up his conception of the management of urban systems to offer computer-based techniques for governing the whole Earth.

WORLD3's attempts to visualize the 'predicament of mankind' by tracing the entangled processes of pollution, world population, industrialisation, food production and resource depletion produced alarming graphs of an imminent catastrophe allied with the exponential growth of an unconstrained world. It projected visions of humanity locked into trajectories of worst-case scenarios and predicted that business as usual was on track to breach planetary limits and cause 'a rather sudden and uncontrollable decline' in population and industrial capacity (Meadows et al, 1972; p. 23). Understanding the Earth as limited and vulnerable had justified calls for technological and economic restraint. The solution proposed was that humanity must 'begin a controlled, orderly transition from growth to global equilibrium.' (Meadows et al. 1972; p. 184). The WORLD3 model scenarios remained blind, however, to the cultural, social and political dimensions of global interdependency – indeed, to anything deemed irrelevant or inadmissible to the computer's calculations.

The World Dynamics approach to scenarios in *Limits to Growth* established integrative long-term systems analyses; the idea of a limited, bounded and fragile Earth; the catastrophic outlook associated with environmentalism; and also the idea that environmental crises were a management problem – requiring only the proper exercise of control by appropriate experts to sort it out.

**Is it possible for scenarios to engender a model, a precedent, a technique for effective governance at a planetary scale?**

#### **'You can be sure of Shell'**

Scenario planning, using similar techniques to those established by Kahn, is now standard practice in business. It is propagated by foresight industries, used for trend watching, and helping to identify emerging market opportunities. Scenario planning is perhaps most closely associated with the company Royal Dutch Shell. As its advertising slogan confirms, Shell aims to reassure, and inspire confidence in the company for consumers and investors in a volatile energy landscape.

Through its ambitious strategy of scenario planning, Shell has reinforced and maintained its hold over global energy imaginaries. It has also asserted its continued and reliable (for shareholders) presence in a future beyond fossil fuels. And as Shell puts it, 'a scenario describes a consistent, plausible future for your company, your organisation, your country, or the world' ([www.shell.com](http://www.shell.com)).

In the late 1960s Shell had realised that its business forecasting tool – a computer-driven system called Unified Planning Machinery (or UPM) – could only work in stable conditions, and was proving ineffectual for what were being increasingly recognised as uncertain times. So the Shell planning department turned to Kahn's scenario techniques and assembled a team of scenario planners to prepare a series of visions exploring the future for oil: the 'Year 2000' studies. Shell's first report, issued in 1972, focused on telling plausible stories about how the wider business context of Shell might develop in the future. It detailed six scenarios, one of which looked at the possibility and consequences of an energy crisis, and potential for diversification. Shell's scenarios did not predict the events of the 1973 OPEC crisis or how soon the crisis would take place, but as their scenarios suggesting a potential shift of power in oil resources had been made public prior to the crisis unfolding, the company appeared to have foreseen it. Thereafter Shell promoted an image of itself as having not only anticipated the future – but also of having been ready for it.

Shell considers scenarios as a way of 'rehearsing the future' (de Geus, 1997). The company's recent scenario outputs 'New Lens Scenarios' (2013), 'New Lenses on Future Cities' (2014), and 'A Better Life with a Healthy Planet: Pathways to Net-Zero Emissions' (2016), explored future changes in global energy consumption and production. The New Lens Scenarios assumed a world in which carbon emissions were not limited, and consequently global temperatures could rise by 4 degrees C. This was a level of warming that the Intergovernmental Panel on Climate Change (IPCC) had argued would have severe and widespread impacts including sea level rises and species extinctions. The company was accused of condoning strategies that could entail catastrophic climate change. As Charlie Kronick of Greenpeace stated, 'What I don't see is a realisation from Shell about what exactly would happen to its business if climate change escalated dramatically beyond what is safe with all the negative consequences in the world for food and water, never mind energy'. Shell did not comment, but an oil industry expert suggested that the scenarios were simply 'plausible assumptions and quantifications... rather than predictions of likely future events or outcomes' (cf. McAllister, 2015).

As the political tide turns against fossil fuels and there are increasing challenges to the orthodoxy of profit incentives, Shell and other oil companies are being held to account. In the wake of the Paris Agreement, the debate has been about how responsibility is shared between governments, consumers and corporate polluters. Shell's current strategy to ready itself for the future is to embrace low-carbon energies while staying focused on its oil and gas business – for which demand continues to be robust and which carries its 'dividend-paying

capacity' (Raval, 2019). Needless to say, Shell's scenario planning apparatus has historically assisted in the administration of wide ranging environmental exploitation and degradation. Scenarios were understood to help make sense of unsettled times and uncertain futures but they were also intended to challenge and re-direct business-as-usual trajectories.

### **Should we be wary of scenarios which are deliberately reassuring or plausible depictions of climate-changed futures?**

#### **From predictions to pathways**

Scenario thinking has long been a prominent strand in the work of the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC), and draws on predictive scientific knowledge, based on computer models and simulations. The processes of the IPCC and UNFCCC have leant heavily on scenarios to explore and present potential future climate risks and responses. Specific details derived from, for example, the IPCC 'Special Report on Emissions Scenarios' (SRES, 2000), have become key in 'communication to activate' strategies. Totemic numbers warning of 'tipping points' — thresholds to profound social and environmental changes — include '450ppm CO<sub>2</sub>' and '2 degrees' or '1.5 degrees of warming'. The 2018 'Global Warming of 1.5°C' report makes uncomfortable reading. Perhaps inevitably, there have been calls to declare a climate emergency: after all, as reported in *The Guardian*, we have only '12 years to limit climate change catastrophe' (Watts, 2018). There is no doubt that there is a need for urgency, but as Mike Hulme points out, the 'literalism of the "cliff edge"... breeds desperate measures', paving the way for extreme technofixes of climate engineering to become mainstream (Hulme, 2018).

The IPCC is careful to state that scenarios of human-induced climate change and resource depletion are not intended as predictions. Rather, they are indicative — something that the climate policy and research community appreciate but that gets lost in the tight spaces of media reporting. In its Fifth Assessment Report (AR5) the IPCC states, 'The goal of working with scenarios is not to predict the future but to better understand uncertainties and alternative futures, in order to consider how robust different decisions or options may be under a wide range of possible futures' (IPCC, 2014).

The IPCC's latest approach to emissions scenarios, or Representative Concentration Pathways (RCPs), was intended to encourage the climate research community to develop its own scenarios. Instead of providing qualitative storylines as in previous reports, the four RCPs — emissions trajectories (8.5, 6, 4.5, and 2.6 watts per square metre) labelled according to how much warming they would produce by 2100 — are intended as a starting point for shaping multiple possible futures. An extended set of RCP scenarios, each paired with one or more Shared Socioeconomic Pathways (SSPs), which describe

potential narratives of how the future might unfold in terms of socioeconomic, demographic and technological trends, are planned for the Sixth Assessment Report (AR6, 2021-22). Yet the worry remains that this scenario science, with its particular socio-technical quantification strategies, simply underscores existing conditions and trends. IPCC scenarios give off an air of strategic foresight and scientific objectivity. Yet in all cases, scenarios and the varied futures they present are shaped at the outset by the intentions and assumptions of the scenario-maker. The challenge remains of how to open up the imaginative practices of climate futures thinking to more collaborative and interdisciplinary working. The aim would be to support a more vibrant and imaginative sense of how humanity might live more equitably, faced with the devastations and displacements that much of the world is already experiencing.

### **What would it mean to create scenarios that really opened up the future?**

#### **Rehearsing the Anthropocene**

The Anthropocene is a scenario about how humanity has affected the Earth so drastically that it has been shunted into a new geological epoch — one that has 'no analogue' in Earth history (Crutzen and Steffen, 2003). This site of geological *unconformity* is also the place of speculation about the residues (and the absences) that humans will leave behind (Tyszczyk, 2016). The Anthropocene announces the catastrophic and irreversible impacts of human activity on the Earth System. Rising oceans, toxic water, species extinctions, nuclear landscapes, climate change: many of the planetary changes that are seen as constituting evidence of the Earth's shift from the relatively stable Holocene to the radically unstable Anthropocene are signposts to a future in which the planet may no longer be able to sustain human life. Yet the Holocene is the epoch in which, for the time being, humans officially dwell. Moreover, it has coincided with the rise of agricultural, urban, industrial societies. The Anthropocene concept thus evokes the *end of the world as we know it*. It is a scenario that, by inscribing *anthropos* in Earth history, does away with culture — and with this, ideas of climate, and even the human altogether. *It is the story to end all stories* (Tyszczyk, 2018).

The Anthropocene hypothesis, or 'geostory' (Latour, 2014), has been made by and with recourse to scenarios. Investigations into the processes through which humankind inscribes itself into geological strata have proliferated imagined futures. The idea of the Anthropocene is accessed through various forms of anticipation: through the integrated modelling exercises that use evidence of previous climatic ruptures as proxies for devastated futures, or the vertiginous trajectories in charts of the post-war Great Acceleration, or the speculative storytelling that warns of fossilized remnants of human civilization — as preeminent cautionary tale (Tyszczyk, 2018). Likewise, responses to this epoch all deploy scenario-thinking — anticipations of the post-human, forecasts

of species extinctions and mutations, imagined pathways to 'good' or 'bad' Anthropocenes, as well as the dreams (or nightmares) of climate control through geoengineering of Earth systems (Dalby, 2016). But the idea of the Anthropocene also introduces the thought that stories, storytelling and scenario-making might need to change in this time of unconformity. So if the Anthropocene scenario is about predicting or rehearsing the *end of the world*, it is also a challenge to find ways of inhabiting an increasingly inhospitable and disrupted world in the present.

**How do we rethink future scenarios from within a worst-case scenario of our own making?**

### Collective Scenarios

The *Culture and Climate Change: Scenarios* project has argued for more ambitious cultural work on scenarios – as purposeful as any climate modelling exercise – to expand the scope of rehearsal of possible futures in the present (Tyszczyk and Smith, 2018). The point of the project was not that more expansive trans-disciplinary collaborative scenario-making would identify more truthful, desirable or even more plausible accounts of the future. Its intention was rather to explore the potential of scenarios as the infrastructure for more collective, improvised and speculative responses to the dramatic transformations that the Anthropocene augurs. For what is often lost in the scenario mode – with all its anxious forward (and backward) looking – are the improvisational and reflexive intentions that were inherent in the origins of scenarios as a situated cultural form. Looking back to their original use in theatre of the everyday, scenarios left room for the actors' capacities to work with surprising situations and unravel the status quo, poking fun at entrenched practices, plausible trajectories and predictable storylines.

There is no knowing what the future holds. There will likely continue to be widespread anxiety about the lack of climate foresight and climate action: We will have done too little too late. We will not have been prepared enough. We will be forced to take drastic measures and make difficult decisions. We will be faced with consequences we can't even begin to imagine. Thinking and practicing the future otherwise involves re-considering responses, responsibilities and obligations – legal, ethical, and political – in the present day with the prospect of climate-changed futures and the troubling realities of an increasingly damaged planetary home. These are, after all, 'matters of care' (Puig de la Bellacasa, 2017).

Collective scenarios, fleshed out through collaborative practices of experimentation and improvisation, are about working together through the challenges of a complex, unstable world. They are about living with climate change and acting wisely within. Such scenarios are not about future-proofing – knowing in advance what is coming and preventing it from happening. Instead

they are about being prepared for what may come while acting, responding, caring and repairing in the present.

As we watch the sun go down evening after evening, through the smog across the poisoned waters of our native earth, we must ask ourselves seriously whether we really wish some future universal historian on another planet to say, 'With all their genius and their skill, they ran out of foresight and air and food and water and ideas'; or, 'They went on playing politics until their world collapsed around them'; or, 'When they looked up, it was already too late'.

(UN Secretary General U Thant, statement to the 7th UN General Assembly, New York, October 1970)

**Let's hope we don't run out.**

## Scenarios and Other Speculative Fictions

Bradon Smith

Scenarios such as those from the IPCC Special Report on Emissions Scenarios provide an apparently solid ground from which to model the future. Scenarios are now a widespread tool in the oil industry too, with the Shell Scenarios only the best-known example. But the ubiquity of scenarios in the business and policy worlds may obscure the fact that scenarios are, on one level, fictions: more or less plausible stories of the future to be used as a starting point for imagining responses to the unknowable. As Renata Tyszczyk reminds us in this volume, the term scenario has its roots in the writing of stories: in the *scenari* of the commedia dell'arte — a rough outline of the story to be fleshed out *all'improvviso* by the actors. Its journey to the strategic planning techniques of the Rand Corporation, and from there into the present horizon-scanning and foresight industries, was via the screenwriters of Hollywood.

Understanding the connection between scenarios and speculative fiction reveals the role of stories in envisaging our climate and energy futures. Stories are often invoked as imaginative spaces in which to consider climate-changed futures: as cautionary tales to warn us of the consequences of our present actions, or as utopias in which to visualize a world we hope to bring into being. Thought of in this way, it is hoped that stories help us to imagine possible future alternatives to the matrix of social, political and economic structures that underpin the present carbon-based energy system.

But stories are also more than this, because to understand these present structures we must likewise acknowledge the role of narratives in them. The economic and political systems that underpin the drilling for oil, capital investment in petroleum giants, and even international climate legislation, are built on narrative foundations.

The Paris Agreement of December 2015 commits governments to the long-term objective of keeping 'the increase in global average temperature to well below 2°C above pre-industrial levels' and to pursuing 'efforts to limit the increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change' (Article 2, 1.a). The agreement leaves the task of deciding how to achieve these targets to individual nations, but clearly these ambitions require the thorough reimagining of our current global fossil fuel-based energy system.

The Paris Agreement is a groundbreaking, global, legally-binding climate deal; and yet, the means to achieve this ambitious target are still largely

unknown. Commentators on the Paris Agreement observed that to limit temperature increase to 1.5°C will almost certainly require some form of carbon capture and storage (CCS); more probably it will require negative emission technologies (NETs), most commonly presumed to be a form of bioenergy with carbon capture and storage (BECCS), in which large quantities of biomass are burned in power stations which capture and bury the emissions (McSweeney and Pidcock, 2015). Neither is yet a proven technology: CCS 'has not been successfully deployed at scale despite major efforts' and, even in the hypothetical, there are 'unrealistic assumptions' regarding the magnitude of carbon dioxide removal achievable by BECCS (Muttitt, 2016; Vaughan and Gough 2016). Amber Rudd MP, then Secretary of State for Energy and Climate Change, responded to a question about negative emissions in the immediate aftermath of signing the Paris Agreement by observing: 'we don't have the answers yet, how we are going to achieve that in the second half of the century' (Carbon Brief, 2016). Projections for an energy system to achieve a '1.5°C world' are currently, then, pieces of speculative fiction. Or, as the journalist George Monbiot rather more scathingly summarised in 2012, 'our energy policies rely on vapourware'.

Discovering oil is also predicated on speculation, on scenarios of future discovery. Oil exploration now uses a range of techniques to search for new reserves, but the process is still an expensive and risky one; early oil drilling or 'wildcatting' was even more speculative. Martin McQuillan sees a 'clear and legible connection between what the oil industry calls "speculation" and the speculative philosophical enterprise' (McQuillan, 2016). He goes on to suggest that:

'speculating for oil has been the basis of industrial modernity and the western economy for the last two hundred years [...]. As that which fuels the engine of the economy, that which makes the economy as such possible, the search for oil is an investment in a venture with the hope of gain but with the risk of loss. The speculative structure of oil exploitation follows from and is now itself the basis for the structure of all investment in stock, property, and the fictional products of capital today'.

The connection that can be drawn between speculating for oil and the speculative structure of all capital investment is one of narrative. Oil prospecting and financial investment are both future-oriented activities, and the imaginative link between the present and the future is always made of story. Without narrative — of progress, of growth, of risk — neither drilling for oil nor the swarming activity that makes up the global free-market economy would make sense.

The importance of imagination and narrative to the process of oil exploration has been demonstrated by Paul Warde in his account of Arctic oil prospecting.

A story of oil discovery needs to be told before the investment and commitment to finding it can be made: 'discovery was underpinned by imagination and will as well as geological knowledge. Narrative and technical choice are thus, in fact, close bedfellows' (2018). Warde quotes then vice-president of Standard Oil of New Jersey, Wallace E. Pratt, who declared that 'unless men can believe that there is more oil to be discovered, they will not drill for oil [...] Where oil is first found, in the final analysis, is in the minds of men'.

That capitalism, too, is a system built on the power of fictions has been argued recently by scholars in economic sociology. This is not just a question of speculation in the sense of risk and possible reward, but is entirely to do with the writing of convincing fictions of the future. As Jens Beckert has argued, fictions are fundamental: 'the decision-making of intentionally rational actors [in economic contexts] is anchored in fictions [...] The mental representations of future states I call "fictional expectations". Fictional expectations in the economy take narrative form as stories, theories, and discourses' (2013). These fictions, he continues, 'do not have to be true but must be convincing' – an observation that is equally apt when talking about narrative art forms.

Sci-fi authors, too, are speculators – but whereas the narratives that drive oil prospecting and growth economics affirm and valorise, spurring us on to more and more of the same type of activity; the narratives of speculative fiction can challenge this relentless momentum. They can turn a critical eye on things as they are, and imagine things as they might be instead. The connection drawn here between oil speculation, capital speculation, and speculative fictions, is not intended to somehow trivialise the mechanisms employed by capital and industry as mere story. On the contrary, it confirms the ultimate *power* of stories in shaping our future. If we wish to challenge the truisms that drive the global fossil fuel-based economy, then narratives that offer chances to critique and reflect may be among the most powerful tools we have.

## Keeping in Mind the Middle

Robert Butler

The American short story writer Edgar Allan Poe said that every detective story should be written from the end. The writer ought to establish a precise moment towards which the story was heading and then construct the plot backwards. The Russian filmmaker and theorist Sergei Eisenstein disagreed with Poe. He recommended that stories be constructed simultaneously from the beginning and from the end: 'keeping in mind the middle sections all the while'. This way, he believed, 'you will have a truly proper correspondence among all the separate parts'. As an aesthetic approach, *keeping in mind the middle* is more than usually relevant for scenarios in the Anthropocene. Take the example of deforestation. A recent advertisement, 'Rang-tan' (2018), about palm oil and orangutans went viral after it was withdrawn from a Christmas campaign on British television. This followed advice that it might be in breach of the 2003 Communications Act, which stipulates that no advertisement is allowed to be broadcast if it has been produced by a political organisation. The advertisement was going to be aired on behalf of the supermarket chain, Iceland, but the film itself had been made by Greenpeace, which was deemed to be a political organisation. The news that the advertisement had been 'banned' attracted huge interest: *Campaign* reported that more than 65 million people watched it online.

The advertisement was an animated cartoon, narrated in verse, with a pitch-perfect voiceover by Emma Thompson. The 90-second film opened with a young female orangutan causing mayhem in a young girl's bedroom – swinging from cupboard doors, knocking over pot plants and howling at a bottle of shampoo. Exasperated, the young girl orders the orangutan to leave her room. But, before the orangutan does leave, the girl asks her what she is doing in her bedroom. The camera zooms in on the orangutan's large eyes, which turn from blue to grey. As the camera moves through the eyes, the colour palette switches from the bright pastels of the child's bedroom to the remnants of a rainforest in black and white. The orangutan's home is in the process of being razed to the ground. It is a nightmare vision of destruction. Back in the bedroom, the girl determines to help the orangutan. She gets out a crayon and a piece of paper. Together, she says, they can do something about this. The advertisement closes with a photograph of an orangutan and the statistic that 25 orangutans are dying each day. This simple narrative pivots on the young girl's change of heart, which springs from her compassion. It must have seemed an ideal campaign for the Christmas season. The girl's actions do not spring from any sudden recognition of complicity in what is going on. She does not throw her shampoo into the bin or swear off ever purchasing any products which contain palm oil. The story ends with a human and an orangutan sitting on the floor and hugging one another.

Both the content of the advertisement and the idea that the TV campaign had been banned provoked various kinds of outrage, mainly on social media. One type of outrage came from its overt content, which showed how a seemingly innocent act of purchasing domestic products in Britain (shampoo, chocolate) was causally related to deforestation in South-East Asia. Another type was expressed by the Malaysian government, who believed that Western environmentalists and policy-makers were misleadingly targeting one of Malaysia's main industries. A third type came from the farmers in Indonesia, Malaysia and Borneo who felt that they had been rendered faceless by the advertisement's simplistic message. In response, a counter-narrative was shared on social media showing the many faces of 'small-scale' palm oil farmers. A fourth type of outrage came with the news that (thanks to the Communications Act) an advertisement which, at the very least, was trying to do something positive was not going to broadcast. In Britain, the hyper-consumerism of Christmas shopping was not considered political; but saving rainforests was.

A theme running through the separate types of outrage was the aesthetic question of *figurability* – what exactly could be represented. The young orangutan's habitat was seen being destroyed, but viewers only saw anonymous trucks heading down tracks and the great claws of industrial machinery ripping out trees. The faces of the drivers of the vehicles and the operators of the machines were never shown. Nor did the advertisement show the indigenous people living in the rainforests. The place where the orangutan lived had been, effectively, *unpeopled*. This 'unpeopling' of place extended to an 'unpeopling' of process: no employees from the palm oil industry were shown (with their own children, who had their own bedrooms), no crew on container ships, or train drivers or lorry drivers, no investors or shareholders, no suppliers or retailers, and no consumers (none of the millions and millions of consumers) other than one little girl in her bedroom.

This is what made the fourth outrage qualitatively different. Online, it was possible to discover the identity of those who worked for the NGO which had advised that the advertisement was in breach of the 2003 guidelines. The mugshots and biographical details of those on the committee were swiftly circulated on social media. The issue had become figurable. The perceived cause of the 'ban' now had a human face and a finger could be pointed at it. Of course these committee members had no more to do with the death of orangutans than the 65 million online viewers, but they had become the focus of the outrage. The advertisement had linked the shampoo in the young girl's bedroom with the destruction of rainforests without hinting at the complex network of socio-material relations that was responsible for that link. The young girl promises to help the orangutan, but the advertisement never explains who might be in a position to prevent so many orangutans dying every day. A quick search online would show that there are multiple drivers of deforestation and palm oil represents a very small fraction of deforestation worldwide. What a glimpse of the immense complexity of the industrial processes might have done

is heighten a sense of shared responsibility and social connection (to use the social theorist Marion Iris Young's terms). What that calls for is a kind of double consciousness, an awareness that small everyday choices made by individuals in one place will, very probably, through sheer force of accumulation, have significant consequences in another place. A politics of place is not sufficient to address this, it requires a politics of *between* places.

The 65 million online viewers might have been more troubled if this interdependence had been strongly marked: if, on returning to the child's bedroom, the walls were no longer decorated in bright pastels, but now reflected some of the dystopian black and white palette of the rainforest. Or if British shoppers had been pictured pushing their supermarket trolleys, piled high with palm oil products (Ritz crackers, Oreos, etc.), through this ravaged landscape. This kind of interpenetration seems extremely fanciful because the two worlds remain incommensurable. The advertisement is a vivid example of the binarism that leaves out the middle. To counter this would require an advertisement that convincingly demonstrates that children's bedrooms, shampoo, chocolate, rainforest, trucks, diggers and orangutans were part of one and the same world. It would show how the beginning and the end are constructed simultaneously. This kind of scenario might dissolve the spatial boundaries to reveal, in Eisenstein's words, 'a truly proper correspondence among all the separate parts'.



## Enflamed Imaginations: Of Fire and Futurity

Nigel Clark

If you were trying to get to a liveable future, would you start from here? On a planet that will roll along as ours does, there is a certain logic to setting out from the places or niches we now inhabit and asking where we would like to end up, or proceeding from where we want to be and working out how best to arrive there. But is that enough?

The lesson of contemporary Earth science is that this is a planet with multiple operating states – with indicators pointing to the likelihood that we are in the process of passing over a threshold into a planetary regime the likes of which *Homo sapiens* have never seen before. When geoscientists seek some sort of proxy for what the Earth might be becoming, they routinely look back millions or even billions of years. If we ‘social thinkers’ are to consider how our species might learn to inhabit what will be to us a new and strange planet, I would suggest we too need a long run up.

The preeminent question for our time seems to be how best we might power our social formations if we cannot continue to combust fossil fuels. Or, rather, if we’re ‘back-casting’ – if we want to arrive at carbon neutrality, at what speed and through what substitutions should we end our dependence on fossil hydrocarbons? But it’s worth remembering that this is a fire planet – the only planet in the solar system that is constantly aflame – and that we are the only species on Earth that regularly handles fire. Evidence also points to an intensification of wildfire in times of rapid climate change. So perhaps there is another question we might layer into our scenarios: if we are not to construct our social futures around the combustion of exhumed hydrocarbons – then what else might we do with fire?

Achieving carbon descent and adapting to hotter, less stable climates is more than a task of developing the technical means of transition. It may be even more than a matter of dreaming up new collective priorities and social orders. It is also, I want to suggest, a question of imagining what physical processes and elements our social formations might join forces with. And this means asking what forces of the Earth and cosmos we have joined up with in the past – and how that brought us to where we are now.

Like Renata Tyszczyk and Joe Smith, what I’m ultimately interested in is the question of ‘what it means to craft shared futures with others’ (2018: 67). Looking at how different human groups have used fire is a way to take this ‘crafting’ literally, to see craftwork or artisanship as an ancient and ongoing interface with Earth processes. Though working or playing with fire is, of course, just one of the means by which we tap the power and potentiality of our planet.

In what follows, I revisit three moments in the ‘fire history’ of our species – or at least, the histories of some of us. At each of these junctures I ask (without necessarily providing answers!) how the crucial innovations might have come about, where they took us, and what else might have been done with this transition or breakthrough. In an exercise that is wilfully speculative and playful, we will try to envisage what trajectories were opened by specific uses of fire and what other pathways were passed over. And in this way we will raise some questions about the elemental ingredients of our inherited worlds – and ask how an expanded sense of ‘becoming with’ the forces of the Earth might help us construct scenarios fit for the task of inhabiting an unfamiliar planet.

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First firing. The oldest known purpose-built structures for containing and intensifying fire were unearthed in the 1920s at the Dolní Věstonice and Pavlov sites in what is now the Czech Republic. Dated at 28–24,000 years BCE, these prototypical kilns would have been constructed deep within the last Pleistocene Ice Age. Indeed, the settlements to which they belong would likely have been close to the edge of the great northern ice sheets. Like hominids have done for hundreds of thousands of years, the Věstonice hunter-gatherers would have used fire for warmth and cooking, to keep predators away, to promote the plant growth that attracted foraging herbivores, and to drive prey animals.

What is new at Dolní Věstonice-Pavlov, however, is the intentional use of concentrated heat to transform the structure of inorganic matter. Along with a voluptuous ‘Venus’ figurine – the oldest known ceramic human representation – archaeologists have recovered some 10,000 fired objects, including animal figures and a profusion of pellets, tubules and amorphous shapes. Fashioned from glacial loss soils and baked at 500–800°C, these primordial fired-earth works reveal considerable ‘control over materials technology’ (Vandiver, 1989: 1008). And yet, there is no trace of vessels, nor anything of any discernible utility. This absence of functionality has led researchers to speculate whether the superabundant trove of fired objects may have more to do with ritual or performance than any valorisation of the actual product.

There is much about these Paleolithic people we do not know. But it seems a reasonable assumption – given the well-documented association of early ceramics with hearth-centred activities, and the absence of male forms in the Věstonice-Pavlov cache – that we are dealing with creativity by and for women. But if there is something ‘earth motherly’ about shaping soil into votive or ceremonial objects, this seems a far cry from any eco-cliché of feminine oneness with edenic nature.

If we are mindful that ancient artisans generally constructed their own apparatuses, then prehistoric female ceramicists should be credited with the original enclosure of fire and its setting to work transforming the inorganic matter of the Earth (Clark and Yusoff, 2018). From the vantage point of all the

subsequent applications of high heat, we might see the invention of the kiln not just as a turning point in human development but as a juncture in the geological history of the planet. For without this primordial chambering of fire and the transmutation of matter it inaugurated there would be no pottery, metallurgy or glassmaking, no boilers, steam engines or turbines. No Anthropocene, we might say, and a rather different Holocene. So too should we recall that this breakthrough occurred not in some balmy moment of climatic stability but in the depths of one of the most violently see-sawing climate epochs in the history of our planet.

My question, then, is where might the development of heat-driven transmutation of inorganic matter have taken us — if it had not taken the pathways that converged on the ‘civilized’ worlds we know? What would the practices of fiery metamorphosis look like if they had remained in the hands of their female progenitors, if the exuberance of artistic expression had taken preference over the practical, instrumental uses of high heat? What kinds of objects and devices, what types of communities or geo-social formations might have come forth from the kiln had we taken a different turning at that juncture some 25,000 years ago?

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Second firing. Fast forward to the Holocene: a warm and exceptionally stable interglacial that sees the rise of sedentary agricultural communities and eventually, in the mid-Holocene, an intensification of agricultural productivity and the rise of city states with pronounced social hierarchies and complex divisions of labour. Contemplating these transitions, historian Theodore Wertime urges us to take account of what he referred to as pyrotechnology: ‘the often forgotten but massive effects of man’s re-shaping of earthy materials by fire’ (1983: 446).

As Wertime proposes, it’s difficult to conceive of the urban-agrarian social formations that became known as ‘civilisation’ in the absence of chambered fire. Vital for rendering grain digestible, the heat of the open fire also fired the earthenware vessels in which cultivated foodstuffs were stored, prepared and served. The early Holocene takeoff of pyrotechnology looks once again to have been the province of women — and it may not have been until the rise of metallurgy (c. 5000 BCE) and the coming of the high-speed potter’s wheel (c. 3500 BCE) that there is a significant male appropriation of high heat artisanship.

Metal smelting — beginning with copper — may well have been an accidental byproduct of the use of metallic ores as decorative pottery glazes. In fact, much of the early use of metals appears to have been ornamental: the fashioning of objects of beauty and symbolic value. As materials scientist and metallurgist Cyril Stanley Smith observes, ‘one (can) feel the joy that early man took in the discovery of the properties of materials’ (1981: 194), though the inappropriate

gendering here should be apparent by now. But just as uses were eventually found for fired clay, so too were metals in due course set to work: as tools, weapons, armour, tokens of exchange, and standards of measurement.

Over thousands of years, the temperature levels of the furnace were gradually ratcheted up, and the range of inorganic materials subjected to fiery transmutation widened. By 1500 BCE pyrotechnicians were regularly firing their kilns up to 1200–1300°C, which is around about the maximum temperature of lava — aside from lightning, the hottest temperatures on the surface of the Earth. Even more impressive is the mastering of complex pathways of material transformation. As Wertime sums up: ‘the pyrotechnic crafts in the years between 10,000 BC and 2000 BC became formidable industrial “disciplines,” entailing the most severe chemical controls on daily operations’ (1973: 670).

While it might be argued that powerful state actors ‘captured’ the pyrotechnic arts and set them to the tasks of city and empire building, there is another sense in which artisanal knowledge continued to flow and mingle across the ancient world. Metal-working radiated out from the Fertile Crescent and surrounding highlands, diffusing east to India and China and west to Greece and Rome and eventually reaching Western Europe — while being independently invented in South America, and perhaps also in sub-Saharan Africa.

Working with fire is always risky, and pyrotechnic skills have usually been viewed as too volatile and too valuable to be fully ‘open source’. Nonetheless, we might see the diffusion of high heat technologies, over many generations and many lands, gradually merging into a vast, decentered platform of know-how and componentry. Not only did the pyrotechnic arts and products proliferate across far-reaching pathways, they actually helped compose these networks (Clark, 2015). As central as ceramics, plaster, brick and tile, concrete, cement, glass, and metal have been to the construction of settled life, these materials and the fiery arts that generated them have tended to recede into the background. But we might see the ability to transmute a wealth of inorganic materials using ‘volcanic’ temperatures as so integral to the shaping of ‘civilized’ existence that it has helped forge the very sensibilities of the urban subject.

So the question we might ask is: what if this far-reaching proto-industrial scaffolding had not been overwritten and largely disassembled by later ways of setting fire to work? What if high heat had remained primarily a means of transmutation — a way to creatively metamorphosise matter — rather than being harnessed more narrowly to turn crank arms, pump pistons, and power turbines? Suppose that the flames of creativity had not retreated from everyday life, that fire had not been subsumed so deeply inside the machine that we ceased to see its flash or feel its heat? What if we still inhabited something approximating a pyrotechnic commons?

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Third firing. Between the enclosure of fire in the kiln and the leap into fossil-fuelled heat engines, there is another world-altering mutation of flame to reckon with. At some point in ninth-century China, Taoist alchemists in search of an elixir of eternal life chanced upon a volatile charcoal-sulfur-saltpeter mix. What its Chinese inventors termed *huo yao* – ‘fire drug’ – and what the English came to call ‘gunpowder’ effected a thermochemical reaction of a violence and velocity the Earth had never before witnessed. As writer Jack Kelly explains: ‘Instead of needing minutes or hours to burn, the fuel would go up in a fraction of a second. This violent reaction, a product of inner oxygen, is man’s fire, concocted, singular, unquenchable. It does not exist anywhere in nature’ (2004: vii).

Like the fired-earth figurines that came before useful earthenware and the jewelry that preceded metal tools, the explosive powder entered social life as a thing of beauty. ‘Before flamethrowers, bombs, and guns filled the world with their terror’, Kelly writes, ‘gunpowder was the servant of delight and the handmaiden of wonder’ (2004: x). But Sung Dynasty military strategists – already masters of flaming arrows – soon morphed fireworks into flame-spouting fire lances and primitive exploding devices, and eventually rockets, cannons, and the precursor of the handheld firearm.

As with the later heat engines that powered the Industrial Revolution, the weaponisation of gunpowder took advantage of the knowledge and materials of the ancient pyrotechnic lineage – not least because the channeling of rapid-releasing thermal energy required a robust metallic chamber. Henceforth, advances in metallurgy and the thermophysics of the explosion would march in step across the Eurasian landmass and through the centuries. While the Chinese take the credit for the invention and early military application of the fearsome black powder, it was Europeans who turned explosive weaponry – through a veritable arms race spanning more than half a millennium – into a world-shifting force. As Kelly reflects: ‘To the Western mind, technical advances moved in one direction. The discovery of gunpowder was a momentous and irreversible milestone on the path of history... Gunpowder was civilization’ (2004: 97).

Technical advances, of course, do not move in one direction, and history has many possible ‘trajectories’ – which is precisely why thinking in terms of scenarios is valuable. And so, we might ask, what if high-speed chain reaction combustion had not found its *métier* in blowing holes in built structures and living bodies? What if gunpowder had stuck with delight and wonder, ceremony and spectacle? Suppose the explosive force of the rocket had gone directly from embellishing the night sky to aiming for other heavenly bodies – without first being diverted through seven or eight centuries of killing at distance?

While firearms and other explosive weaponry did not lay the technological foundations of the Industrial Revolution, they played a vital part in the concentration of wealth that prefigured industrialism, in the securing of resources to feed and fuel industrialisation, and in the imposition of industrial capitalism as the globally dominant economic model.

But so too did the fiery heat engines of modernity inherit a much longer tradition, enfolding, advancing on, and repurposing the discoveries of thousands of years of pyrotechnical experimentation. And this great spree of high heat research and development built upon much earlier innovation in the containment of fire – which in turn built on perhaps a million years of hominid hearths and open-field burning.

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We can’t just rewind history to any of the fiery junctures I have identified. And probably few of us would care to, though we shouldn’t rule out the possibility that catastrophic events might indeed unravel our more complex thermophysical infrastructures – just as power cuts can ‘regress’ us to log fires and barbecues. What I have been trying to do in exploring the literal artisanship behind any ‘crafting’ of scenarios, is to show the deep, historical significance of working with fire in the making of the materials we rely upon, in the shaping of the sociotechnical platforms we inherit, and in the very forging of our imaginations and subjectivities

But fire is really just a case study, a particular enthrallment of mine. The more general point is about how we might learn to sway in tune with an Earth whose rhythms we cannot yet divine. As the imagining of new collective ways of being and doing, I want to insist, scenario-building in the context of climate change is an exploration of potentialities that inhere in the Earth and cosmos. At some level, every scenario must involve a tapping into, and an elaboration upon, the material-energetic expressiveness of our planet itself – a claim that builds on the assumption that, even under conditions of intense environmental pressure, there is always an excess of possibility nesting in the strata and flows of the Earth.

One way to expand our sense of these possibilities, I have been proposing, is to look back, to ‘retro-cast’. That is, to step away from the deeply incised and densely overwritten pathways of the present, to try and imagine what alternative tracks we might have taken, what other opportunities might still be slumbering within the stuff of the world. More than just a multiplying of options, this is a way of unsettling the very problems we are choosing: a suggestion that thinking *with* and *through* the Earth might be a way of ‘materializing’ new questions or of unearthing old ones.

Finally, I have tried to show how many of the basic ingredients of our socio-material worlds most likely emerged through accident, chance, play, or open-ended experimentation – even or especially at times when we might assume that basic survival was the top priority. Necessity, if we are not careful – or rather, if we are *too* careful – can lead to the smothering of invention. As Benjamin Preston and his colleagues observe, in the troubled corridors of climate adaptation research ‘there is increasing demand for a clear line of sight between research investment and evidence of its economic, societal or environmental

returns. This has translated into a greater emphasis on problem-oriented, rather than curiosity-driven, research' (Preston et al, 2015: 128).

It's worth recalling Renata Tyszczyk and Joe Smith's point that the art of scripting scenarios itself began many centuries ago in the context of the improvisational joy and clamour of live street performance (2018: 57). A closely related point might be made about the very knowledge practices and techniques with which we grapple with climate change. As Cyril Stanley Smith likes to remind us, the better part of today's scientific and industrial technologies emerged from a context of art and craft, which is to say, out of 'a rich and varied sensual experience of the kind that comes directly from play with minerals, fire, and colors' (1981: 203). And as he goes on to conclude: 'Discovery requires aesthetically motivated curiosity, not logic, for new things can acquire validity only by interaction in an environment that has yet to be' (1981: 325).

Starting in an ice age and ending on the threshold of runaway global warming, 30,000-plus years of experiments with high-heat-induced transmutation of matter seem like a useful experience to feed into the scenario-making process. Turning away from the barrel of a gun, Kelly closes his meditation on gunpowder by coming back to the beauty of fireworks. 'The explosions are splendid waste', he muses. 'They are wild-haired comets, silver rain, tinsel-starred bouquets' (2004: 238). Any scenario that will not admit something of this blaze of glory, it seems to me, doesn't deserve to be in the game of fabulating liveable futures.

## The End of the World Show

Joe Smith

What kind of language should we use today to describe the prospect of the end of the world as we know it? This profoundly difficult question has been running in parallel with the history of space flight. Since the first glimpse of NASA's photo of the whole Earth from space, humanity has been struggling to put into words the enormity of the impacts that we are having on the world we inhabit. There has been a steady flow of declarations of crisis and emergency across several decades. Environmentalism has summoned up a legion of arresting images and phrases in the attempt to bring the future into the present and motivate effective action. But does the conjuring of catastrophic scenarios work? Do they work for enough people to bring change?

British astronomer Fred Hoyle suggested in 1948 that: 'Once a photograph of the Earth, taken from the outside, is available... a new idea as powerful as any in history will be let loose.' That new idea was environmentalism. And indeed since attaining this 'God view' of the planet we have been driven to think harder about the terms of inhabitation of our only home in the universe. The Earthrise image of our planet, taken by astronaut Bill Anders on the 1968 Apollo 8 mission, is the mother of all drone footage. Having gone all that way these expeditioners could barely take their eyes off home. Indeed astronauts have consistently said that the most impressive thing about going into space isn't 'space' at all, but the new perspective they gain on the interconnected nature of life on Earth. The image has become a touchstone for modern environmentalism, signalling, among other things, the shared fates of Earth's diverse organisms.

People who have worked on communications aspects of this issue have long wrestled with the fact that climate change is a passive and merely descriptive term for a situation that humans have actively caused and must now actively work to mitigate. Furthermore, the research and policy processes and outcomes are complex, slow, and riven with uncertainties. One recent attempt to accurately name the stakes has been to insist that we describe the present moment as a climate emergency. But how long can we talk about a present state of emergency without having to redefine the meaning of the word? How do you imagine a slow crisis – a very distributed, and very uneven, experience of emergency? For people and places directly experiencing more frequent and intense extreme weather or 'natural disasters', the phrase seems apt. But for most people in the developed world, where both responsibility for the crisis and the power to act are most highly concentrated, even extreme weather events tend to be coped-with rather than suffered. There is a serious danger that the phrase *climate emergency* could rapidly lose impact amid the many other demands on people's 'finite pool of worry'. Only wealthier people and societies can insulate themselves from near-term risks and block out the noise from the street outside.

Moreover, this state of affairs is not new – crisis has been declared so often, there is a danger of emergency fatigue. The media are often criticised for failing to tell the story of environmental crisis. But broadcast news in particular has been troubled for at least five decades by the problem of how to tell the story of ecological collapse. Time spent in media archives demonstrates that the ‘end of the world show’ is one of the longest running strands in broadcasting. In the British context, environmental scientist Frank Fraser Darling was booked to give the BBC radio Reith Lectures in 1969. His lectures, titled ‘Wilderness and Plenty’, were commissioned as ‘... in effect a warning about the ecological and environmental changes now being brought about haphazardly and with uncontrolled and gathering momentum’. His pitch for the series explained that it would be centred on the question: ‘How do we arrive at a *modus vivendi* which will not render civilisation a contradiction in terms ecologically?’

Are we now in the ‘real’ emergency? Were previous alarm calls just rehearsals? Were the ‘eco-crisis’ TV specials distributed across the last half century of programming wrong? Anyone with some connection with biodiversity research and policy will know that there have been devastating losses of species and habitats across this period. Urban air pollution has taken a heavy toll, particularly on the poorest, and unmitigated climate change will accelerate suffering and loss in the near future. Immediate action is imperative; earlier would have been better. But after decades of watching the end of the world show it is clear that many, perhaps most, people are immobilised, not galvanised, by this talk of ‘crisis’. Cassandra wasn’t wrong, but did struggle with her communications strategy. Some have argued that climate change is a problem designed to defeat the human brain’s capacity to problem solve, and that no amount of rebranding will overcome this.

But might it not be rather that people tend to have a good instinct for authenticity? They know the necessary transformations can only occur as a result of a steady, purposeful pace. Making homes energy-efficient or developing mass transit that uses little or no fossil fuels is going to take time and care. Terms such as ‘crisis’ and ‘emergency’ suggest a sprinter mentality: bursts of urgent effort spurred by a fight-or-flight response. The sustainability transformations we are in the midst of – albeit in the early stages – just aren’t like that, and everybody in their heart knows it. They require a marathon runner’s mentality. We need to make far-reaching changes to many aspects of contemporary economies and societies, and hold everyone together while we’re doing it. Getting to the finish requires a race-plan that will cover the whole distance.

That plan requires innovation in our political, policy and economic ideas and language, and this needs to be woven together into engaging accounts of the future that can be worked with across a broad political spectrum. Consensus across a spectrum is vital because the changes required need to be sustained across at least three or four election cycles in democracies. All of this can be strengthened and accelerated by a cultural politics of environmental change that is improvisatory, experimental and, when the moment calls for it, visionary.

This can include entrepreneurship around how societies thread together objectives about the future of work, health, cities, homes and streets with clear goals about managing down climate risks and protecting and expanding space for the non-human natural world that we depend upon. This implies above all adjusting our systems of taxation and spending so that the prices we pay for goods and services reflect their full environmental costs. Putting the right price on carbon – a central task that is already woefully delayed – holds the potential to reward good decisions and punish bad ones in a consistent, transparent and quickly scalable way. There are numerous initiatives globally that point the way. Varied proposals for economic ‘green new deals’ signal the scale of thought required. These are more continuous with present trends than they may at first seem – the fact is that climate change has been one of the greatest drivers of technological innovation for some years now. In other words: we know that there are effective actions we can take to mitigate climate change and adapt to its effects. Furthermore, many of these demonstrate that we can work toward other vital objectives, including social equity and public health and wellbeing, in the process.

The UN’s Sustainable Development Goals or SDG’s express this very clearly. They amount to the global plan of action on poverty, climate change, resources and biodiversity. Yet those that have heard of them find it difficult to turn them into touchstones of everyday debate or action. These seventeen SDG goals, and the linked body of 169 indicators, cover an array of social and environmental objectives. Together they amount to a plan and a process for advancing towards a fair future for all of humanity on a viable planetary home. And they are just a subset of a larger toolbox of approaches. Patient hard work by tens of thousands of people delivered the 2015 Paris Agreement on climate change. National and regional policies and laws are growing like weeds: the UK’s 2008 cross-party Climate Change Act is just one early example that commits all UK governments to decades of action and reporting. These are extraordinary achievements and powerful tools. They are powerful above all because right at their heart is the principle of a ratchet of continuous review and revision. They are also forms of policy-as-scenario game. They offer a structured way of making the future a tangible present-day concern. Their structure means that the right kinds of pressure can accelerate action and change the outcome for the better.

But the insistence on driving attention towards singular objectives, or focusing on one element of the complex challenges ahead, risks obscuring the real potential for systematic transformations. A surge of popular concern and commitment has been both revealed and extended by the civil disobedience of, for example, Extinction Rebellion and the school strikes. The widespread awareness and energy can only be sustained by harnessing it to a positive account of where we might go next.

The repeat-loop End of the World Show has reached a good number of people, steadily raising awareness of an interconnected bundle of profoundly important concerns. But with its repetitiveness comes the risk of diminishing

returns. There is a new stock of stories to be told that has a different ending in mind and brings the future into the present in a very different way. There is now plentiful evidence that humans do have the capacity to strip carbon out of our economy, and a growing number of success stories about the communities most vulnerable to climate change leading the charge to mitigate the risks they face. The most important theme in this new crop of stories about the future is that many of the actions that can slash climate risks, and help communities live with them, will make the world a better place in other ways as well. There is much reason to be hopeful: maybe that, above all, now needs to be the story.

# Climate Change in Residence

## We Are All Climate Researchers

Renata Tyszcuk

In December 2015 at COP21, Culture and Climate Change launched the *Scenarios* project, including a call to artists to apply to the 'Climate Change in Residence: Future Scenarios' networked residency programme. Our ambition was to catalyse new creative work that would encourage more imaginative, but also more purposeful, responses to the challenges of climate change in the present and into the future.

The call for proposals resulted in 270 applicants, from whom Emma Critchley, Zoë Svendsen, Lena Dobrowolska and Teo Ormond-Skeaping were appointed. From July 2016 to June 2017 they engaged with climate scenarios within climate research networks. The challenge was to open up thinking about this central conceptual tool in climate research and policy in the wake of the 2015 Paris Agreement.

'Climate Change in Residence: Future Scenarios' was a year-long pilot of a new model of arts-science residency, that of a 'networked residency'. Our intention was to both mirror and engage with the distributed but interconnected nature of climate research. The programme was devised with the support of Hannah Bird, and drew on her extensive experience of arts production and her research into artists' residency programmes. The programme's strategy was to embed itself within climate research and policy knowledge networks. Rather than a traditional residency based in one institution, this networked residency engaged with the research community across institutions and disciplines whose work collectively informed the development of climate scenarios. Most importantly, the intention was for the artists to join this community as researchers in their own right. Indeed, inspired by the artist Joseph Beuys' phrase 'we are all artists', our motto for the residency became, 'we are all climate researchers'.

The *Culture and Climate Change: Scenarios* project was an attempt to defy the widely held view that cultural responses to climate change from the arts and humanities are late-phase communications that come after the science and policy is done. The residency programme thus started from the presumption that arts and humanities practices were not simply a response to, but rather an expression of, and essential component of, climate research.

Moreover, the residency was focused on the processes of collaborative research rather than artistic outputs. The experimental and improvisational elements of the *Scenarios* residency centred on the structuring of a sequence of hybrid and experimental workshops involving different researchers. This produced rich and varied encounters between different modes of knowledge sensing, making and sharing around climate change. Over the course of the year the artists engaged with a range of approaches to climate scenarios – including

the models of research scientists, the designs of urban planners and the forecasts of policy makers. The project saw polar oceanographers, climate modelers, economists, architects, theatre-makers, artists and geographers responding with their own re-thinking of climate scenarios, or working in new ways with the prospect of climate-changed futures. This reinforced a point that has consistently been made across the Culture and Climate Change events and publications: *that the arts and humanities don't simply 'follow on' from natural science and policy work, but rather, are interventions that change it.* The relationship, in other words, is reflexive.

Indeed, the improvisational and reflexive intentions inherent in scenarios have served as a touchstone for the project. Our framing for the *Scenarios* residency was one of 'collective improvisations'. This referred to both the origins of scenario-making in improvised street theatre, and the 'collective experiments' of climate change. It drew on Bruno Latour's observation that laboratories had turned 'inside out' to become 'the world wide lab', such that 'we are all engaged in a set of collective experiments' in the 'confusing atmosphere of a whole culture' (2003). This aligns with cautions regarding how the predictive knowledge of climate research tends to set the terms for running a worldwide sociocultural experiment, that is, 'bringing the worldwide emissions of greenhouse gases under directed management' (Hulme and Mahony, 2010).

The *Scenarios* residency programme gives an idea of the potential of a sustained collaboration between the natural and social sciences, arts, and humanities in the public spaces of climate research. Working collaboratively, with moving image, photography, installation, theatre and performance, the artists explored and extended the ways in which society might reimagine scenarios of climate change. The artists/climate researchers kept diaries as they worked with the idea of scenarios and presented their work in progress at workshops, seminars and public events. The varied projects are ongoing and iterative and hint at the multiple possible ways of responding to the complexities of climate change.

Teo Ormond-Skeaping and Lena Dobrowolska have explored the scenario mode in their documentary photography and film practice in their *Future Scenarios* project. Their field-based research in Lao (PDR), Bangladesh, Uganda, the US and the UK addressed climate change adaptation in places where climate change is no longer a future scenario – and where the impacts are intensifying. Their work directly responded to the arguments of Saleemul Huq and his colleagues at the International Centre for Climate Change and Development (ICCCAD). This Bangladesh-based research and policy centre has shown the ways in which communities deemed most 'vulnerable' to climate change, above all Least Developed Countries (LDCs) such as Bangladesh, were also providing practical and intellectual leadership in demonstrating capacities to adapt to climate change. Their scenario-making opens up a dialogue about a yet-to-be-determined-future, asking important questions about political inequalities as well as new modes of governance and inhabitation in unsettled times.

Emma Critchley's *Human/Nature* project investigated the 'frontiers' or thresholds of human reach, including the deep sea and deep space. Emma's scenarios for her film *Common Heritage* were generated through collaborations with deep-sea ecologists and climate researchers at the Universities of Southampton, Plymouth, Cornell, Washington and Cambridge, and the British Antarctic Survey. Part of her research is about acoustic pollution and its impacts on cetaceans as sound-oriented creatures. Sound here is not just an indicator of humanity's ever-growing environmental impact, but a powerful metaphor for climate change – something it is possible to be immersed in, yet which falls on different registers. Emma considers the embodied and experiential aspects of change in the non-human natural world, but also aims to show the inseparable relationships between that domain and the distinctively human world of international politics, resource exploitation and territorial ambitions.

During her residency, theatre-maker Zoë Svendsen developed *WE KNOW NOT WHAT WE MAY BE*, a performance installation at the Barbican in September 2018. Zoë was drawn to the economic and related social and cultural consequences of a climate-changed future. Her investigations were rooted in a series of 'research in public' conversations with economics, politics, business and social science climate researchers who were challenged to imagine what it might *feel* like to live in a society, and economy, designed in the best possible way to respond to climate change. The interactive performance installation engaged audiences in exploring these alternative economic futures, discussing various economic measures (eg universal basic income, carbon tax), ideas about the future of food and land, the impact of robotics and AI and the changing relationships to work. Participation in the theatre event led to the creation of a collective vision of an alternative future, shared live and online.

The 'collective improvisations' of the *Scenarios* residency have explored ways of expanding the ethical, material and imaginative registers that living with uncertain climates might mobilise, and practiced knowledge making in climate research in collaboration with others. Since the end of the residency the artists have continued with their projects, informed and inspired by their varied encounters with other climate researchers. In the following texts, Zoë, Emma, Teo and Lena reflect on the residency programme. Each essay is followed by an extract from their monthly diary accounts.

Scenarios as collective improvisations invite a way of responding creatively to change that can cope with past and present disturbances and disagreements and the multiple and contested agencies in play on a dynamic planet. They can also provide a 'rehearsal space' that may generate more robust and considered responses to the social transformations that will inevitably be part and parcel of climate-changed futures (Tyszczyk and Smith 2018;2019).



## Supporting Scenarios

Hannah Bird

My story is one of support. Supporting ideas to flourish and creative processes to take shape, supporting burgeoning artworks and ideas for the future, supporting academic institutions to connect with thinking outside their sector and artists to find cracks through into institutions.

I was the producer for 'Climate Change in Residence: Future Scenarios', the *Culture and Climate Change: Scenarios* networked residency programme. My role was to design, develop and deliver a programme that would test new ways of working in order to support cultural engagement with climate futures.

I have worked in the culture & climate change field since 2006. I led art/science expeditions in the Arctic and Andes for Cape Farewell. I was the inaugural producer on the *What Has To Be Done?* project, a homage to Joseph Beuys's sailing expeditions in the Western Isles of Scotland; I managed a series of TippingPoint conferences; and I worked with the Culture and Climate Change team to produce the *Narratives* publication which forms part of this series. I'm at my happiest when I'm developing collaborative projects between the cultural sector and other disciplines.

My reason is not one of worthiness or urgency, though both of those are solid motivations to dedicate your profession to climate change. My motivation is curiosity. I find myself lodged at the intersection of art, science, politics, society, geography, ice melts, history and change. We are living in a paradigm of finite growth and infinite change. We don't know whose visions of the future will be the most accurate. We haven't figured *It* out, we don't know how to solve *It* and we don't even know if *It* is something to solve. What we do know is this: we have to be able to imagine something different in order to start making something different.

I am drawn to being a producer amongst this upheaval supporting creative engagement with climate change, and building projects that encourage cultural participation in issues of environmental concern, so as to create the right conditions for new ideas and collaborations to flourish.

With curiosity as my driving motivation, I was drawn to producing *Future Scenarios* – an idea that, at its genesis, had no clear *modus operandi*, no defined outputs, and no participating artists.

We did have a starting point – The Future. Climate scenarios are heavily relied on in developing climate policy, but there was no history of cultural engagement with the making of scenarios and the imagining of our shared futures. Our hunch was that this would be a fruitful topic for artists.

We wanted to model the processes of how climate change research is done in the way we built our programme. We wanted to test a networked residency model – one that embedded artists in an idea (scenarios of the future) and

not in an institution. We were interested in testing how creative processes can impact the development of new ideas, climate research, and ways of working. We wanted to test the idea of artists as climate researchers, challenging traditional residencies, where artists predominantly play the role of responding to research. We were committing to developing new creative ideas and new ways of *thinking* and *practicing*, not just new ways of communicating existing research.

We wanted to do all this in a way that placed the artist at the centre. A process that supported them to develop their own creative practise – based on their individual interests and our expertise – whilst helping them to navigate the complicated field of climate research.

We launched the opportunity at COP21 and received an overwhelming 270 applications. It showed us that our hunch – that future scenarios might be a fruitful topic for artists – was correct. After an in-depth recruitment and selection process, we appointed four artists at our launch at the Jerwood Gallery in May 2016. By July 2017, when the programme officially ended, we had developed new ideas, connections, artworks, research, and scenarios.

Some of these outputs were serendipitous, some were intended; all were supported in taking shape by the structure that we had moulded. The lessons of hindsight show certain factors in our project that might usefully be transferred to other projects that aim to connect creativity and climate research.

**Front-load it with thinking – stand on the shoulder of giants.** There are many brilliant people doing great things and creating useful models of best practice. We spent time observing different residencies to learn from others. We spoke to experts, including ones based in science institutions like CERN, NASA, and the European Space Organisation; and arts and academic institutions such as Free Word Centre, UCL, Exploratorium in San Francisco, and MIT.

**Start with identifying user needs.** Over the life of the project we developed an understanding of our artists' needs and interests. Our idea was that the residency would be self-led with a very light structure to support them. We created shared moments of connection – workshops, mentors, online blogs, collective catch-ups – and crucially left space for the artists to populate the structure with content and ideas that met their priorities. Your users have to trust you with the process, and you have to trust them with the content.

**Consider group dynamics.** Through the recruitment process we wanted to ensure our artists approached the residency with flexibility – that they would be willing to be challenged, to step into the unknown, and to share their learning. They had to be open to collaboration. In selecting participants, we considered the group and not just the individual, the whole being greater than the sum of its parts.

**Aim for equality of collaboration.** It's not enough to get people in a room together. Collaboration doesn't mean everyone doing and thinking the same,

it's about recognising different expertise and seeing the value in testing and challenging your own approach through an encounter with someone else's. We wanted to create a space where everyone's expertise was valued. Moreover, we wanted to create moments for co-dependency, for shared challenges, so the participants began to rely on each other and not on the structure of the residency. This ensured that the connections stimulated by the programme would outlive it.

**Don't be afraid of failure.** Steven Johnson in his book *Where Good Ideas Come From* says '*Being right keeps you in place. Being wrong forces you to explore*'. We encouraged our artists to be challenged, to learn, to do better. As the residency producer, I demanded that of myself too.

Supporting creative processes to take shape means you must consider not just the structures that will allow projects to flourish, but also your role – asking how you can create conditions that will support cultural engagement with climate futures. Those around you may be in new and different environments, exposed to new and different ways of thinking. This also involves noticing individuals who may be feeling vulnerable and exposed, and offering extra support. You must be willing to be flexible in your response to changing group needs. Be challenged to not know the outcome of the journey at the start, but trust the process of the model you have created. Things will not always go to plan, so find comfort in the fact that we do our best learning when things fail. The legacy of the project is not in the successful delivery of this residency, but rather in what happens next. Supporting Future Scenarios was my commitment to creating the best possible conditions for artists to engage with climate scenarios because we have to be able to *imagine* a different world in order to start making a different world.

## WE KNOW NOT WHAT WE MAY BE

Zoë Svendsen

'We know what we are but know not what we may be.' So says Ophelia in Shakespeare's *Hamlet*, articulating the motivation for this interactive installation: to work out who we might be in an alternative future – a future that creates a more just society, and in doing so averts runaway climate change. *WE KNOW NOT WHAT WE MAY BE* was an installation at the Barbican in September 2018 that brought together people from many walks of life, participating in three different ways: as audience, as speakers, and as artists. Although these roles began as distinct from one another, they would merge across the installation – as audience members created new ideas and collaged possible futures, speakers participated in responding to scenarios, and artists played, conversed, represented, and observed the action. The installation's design was guided by our aim to draw upon a plethora of different contemporary visions for change – specifically, the change that might be required at the level of how society is organised.

The installation lasted five days, with a new group of audience-participants – who we called a 'generation' – entering every hour. First they heard a specialist explore a particular perspective on the future and some ideas on how to address climate change – covering topics as diverse as AI, food futures, energy, architecture, and post-capitalism. Then a great iron door drew back and the group of newcomers entered a space – the Factory of the Future – in which previous 'generations' were already collaborating on imagining future possibilities. The space was divided into two 'times':

The 2020s offered a kind of parallel near present – a 'Factory of the Future' for imagining scenarios. Scenarios on postcards circulated and each was discussed, modified and fleshed out across a series of conversations. Each scenario represented an alternative economic 'near-future' idea – an entirely implementable action mooted and discussed by many, but not yet ever implemented in full.

Each conversation took its own time before people decided whether they would sign up to sending the scenario forward for imagining in the area we called the 2040s. They then took a new scenario from the circulation system and started a new conversation. Music enveloped the space, making each conversation private, and marking off intervals in which participants were asked to commit fully to the conversation. Such periods of 'commitment' alternated with times when birdsong heralded the possibility of moving on, shifting the conversation, beginning again elsewhere.

We called the proposition on the postcards 'scenarios'. Technically, however, they were more like ideas or policy proposals. However, in the course of workshops, we found when we changed the grammar from something that

*might in the future* be the case, to inviting people to imagine it was *already the case*, it enabled us all to pitch our thinking a little further into the realm of the imagination. Earlier, we'd called the postcards 'policies', but then conversations became bogged down in the technicalities of how to realise the ideas. When we called them 'ideas', the response seemed to be sharpened critique – an 'idea' seems to trigger a response that dismantles rather than builds on it. Neither of these modes got us anywhere close to imagining an alternative future. So we changed the tense of the description on the postcard to the present, and called it a scenario: a tacit invitation to imagine the change as already having happened, and to make the leap, imaginatively, into considering what it might be like to live under those conditions.

Once a scenario received enough signatures from conversants, it was then announced as being voted through, with thanks to the generations who discussed and developed it. It was then passed to the 2040s. The FLYWAY TO THE FUTURE displayed the outcomes of scenarios once they were approved – accumulating over the five days of the installation. The flyway connected the 2020s to the 2040s. People wandered along and saw progress being made on their way to the 2040s.

The 2040s is not a precise date: it is a time near enough to touch yet far away enough to imagine things have changed. In the 2040s people could trial the NEW NORMAL: exploring the question, what if the scenarios envisaged in the 2020s had become everyday life?

Impacts, outcomes, events, places, life roles, job titles, city transformations, energy transitions could be imagined. The 2040s area was where the outcomes of the scenarios were prepared for experimentation in the COLLABORATORY. Sometimes this involved people writing the biographies of people of the future. Sometimes it inspired people to make collages, inventing a different future formed from the images of today. Some people made things for the two City models on our bespoke turntable: one a map of the City of London (the world up there, above the Barbican), and the other a 'slice' of a generic city space. The 'slice' started out as a typical city – orientated around cars, lacking human connection, a blank canvas for the projection of dreams that slid away as quickly as they were manufactured. By the end of the installation there was barely a surface that hadn't been appropriated to the social use of its imagined inhabitants – who were now connected by a series of sky walkways, held parties on the roof, shopped in local stores nestled at the foot of the buildings. Energy production was visible and accountable; Thames-side flooding had shifted from disaster to a managed flood plain, offering leisurely walks in a new parkside. The river Fleet was no longer underground. The City was no longer solely a money-manufacturing machine.

In the COLLABORATORY, a series of performance montages by performers, using the City slice or the map of the City of London, took this unfolding vision of the future to explore the perspectives of the people of the 2040s. The performers used character, voice, video, collage, and music to envisage a future

in which the scenarios had become everyday life. This was where the real act of scenario creation came into play. Together, these different propositions opened up a future scenario in which not only was climate mitigation a possibility, but became a concretely imaginable human environment that was interconnected, co-responsible – and much more enjoyable to live in than the present.

THE COLLABORATORY thus imagined how alternative futures might play out, with different kinds of improvisation games based on the scenarios audiences had voted through, described here:

VOICES FROM THE FUTURE was an improvisation game that spotlighted people, places, and events living the NEW NORMAL.

CITY TOUR traced a path through various everyday lives in the NEW NORMAL.

WE KNEW NOT WHAT WE WERE was a 'live; radio show looking back to the crazy teens of the twenty-first century from near its mid-point, the 2040s.

IF WE CAN DREAM UP THE END OF THE WORLD THEN WE CAN DREAM UP THE END OF THE END OF THE WORLD saw citizens of the 2040s remaking the disaster movies of yesteryear in the spirit of the new normal.

REALM OF OPPORTUNITY asked, what possibilities do the scenarios that make up the new normal have to offer? What kinds of city redesign might this mean?

CITY OF DREAMS was a chance for people from 2018 to tell us what they imagine when asked to envisage a better future.

The use of a multiplicity of performance modes to represent scenarios of a lived, felt future under alternative economic conditions was not an accident. Rather, it demonstrated that generating scenarios to imagine a better future is not the same as attempting to create Utopia. There was never one single future at stake – no single best possibility, and no prediction about how it all might turn out. Scenario-making can hold multiple directions for the future in play, producing many possibilities that interlocked and overlapped, but made no claim toward being the ultimate reality.

The installation was structured through a variety of interlocking and overlapping timescales – from a seven-minute performance, to the open length of a conversation, to elements that evolved over the whole five days of the installation. Gradually, for example the four-metre high lettering on the walls, spelling out TRAGIC or EPIC, became covered in postcards. Each postcard had a contribution on it from an audience member or a workshop participant about what they thought would make the world a better place. Each audience member was also supplied with a bag, containing items – postcards, pens, a programme

– that they might find useful. This bag also contained a piece of ‘debris’, which they were instructed to discard somewhere, slowly choking up the clean lines of the installation.

#### CODA

But why future scenarios? Why is the role they play so important? The effort of creating them – for us, and for everyone who has engaged with the project – holds, I think, a key to the difficulties we find ourselves in culturally and emotionally when it comes to countenancing radical change. History shows that in fact we adjust very quickly once change happens. But psychology suggests that, in countenancing change, we find it very much more difficult to imagine a future that isn’t directly linked to our immediate past, or our current perception of progress. And that’s the trouble: in order to be able to move towards a future that does not destroy the planet, we need to be able to imagine what it would be like to live in a transformed society. A society that is not based on the principles of extraction and transaction, but plays a part in a wider ecosystem of relations, and derives its satisfactions from ingenuity and lightness, rather than accumulation and waste. And it seems that we are much more easily able to imagine devastating losses within the current socio-economic structure than we are to construct another reality, a different path – one that reaches towards achieving the sociable and fair world so many long for. We have hundreds of postcards, written by a very broad demographic, that testify to a common desire for a just, kind, socially orientated future – but the arguments invited by the installation indicates how little consensus there is over how to achieve it. That famous phrase, ‘it is easier to imagine the end of the world than it is to imagine the end of capitalism’ must be overturned. In *WE KNOW NOT WHAT WE MAY BE* it was replaced with a quote from the performance artist Lois Weaver: ‘If we can dream up the end of the world, then we can dream up the end of the end of the world’. And that is what we started to do in the Collaboratory – create imagined spaces for rehearsing futures that do not involve the end of the world. Instead what emerged was an imagining of a de-financialised, locally interdependent culture un beholden to big business, in which people had more time – time to engage with one another and to take care of the world around them (whether human, animal or plant).

The project is ongoing, taking forward the ideas and visions that were so generously shared at the Barbican, to share them in further performance and installation events. Our larger aim is to develop the social, collaborative, imaginative muscles that we are going to need to face the coming storm. In this effort we take seriously Amitav Ghosh’s admonishment to the arts. Describing the general cultural amnesia around the climate crisis as ‘the Great Derangement’, he says:

‘When future generations look back on the Great Derangement they will certainly blame the leaders and the politicians of this time for their failure to address the climate crisis. But they may well hold artists and writers to be equally culpable – for the imagining of possibilities is not, after all, the job of politicians and bureaucrats’ (2016).

The imagining of possibilities is our job now, as artists – and it has shifted frighteningly quickly from being a space of playfulness to a condition of our future survival. We must not fail in our task of imagining that things might be otherwise. Each individual story we find ourselves telling is small-scale, everyday, not particularly dramatic – but it is epic, this journey towards another future, not tragic. We refuse the role of the tragic hero going down in flames, nursing our precious high-carbon individualism – and taking the planet with us. We take to heart the rallying cry of Christiana Figueres, Chief UN Negotiator for the Paris Climate Agreement: ‘impossible is not a fact, it’s an attitude’.

*WE KNOW NOT WHAT WE MAY BE*, a performance installation was developed as part of the Future Scenarios Residency for the *Culture and Climate Change: Scenarios* project, supported by the Jerwood Charitable Foundation, Open University and the University of Sheffield. It was commissioned by Artsadmin and presented by the Barbican, 5-9 September 2018. The essay above is adapted and augmented from the notes to the programme.

*WE KNOW NOT WHAT WE MAY BE* was part of the Season for Change, a UK-wide programme of cultural responses celebrating the environment and inspiring urgent action on climate change #SeasonforChange and also part of the Barbican’s 2018 Season, The Art of Change #TheArtofChange. *WE KNOW NOT WHAT WE MAY BE* was supported using public funding by the National Lottery through Arts Council England with additional support from Attenborough Centre for the Creative Arts, Barbican London, New Wolsey Theatre, Cockayne – Grants for the Arts and The London Community Foundation, J.E. Wilson Fund and University of Cambridge.

*Factory of the Future* is a further project inspired by the Future Scenarios Residency and presented at DOGA, Design and Architecture, Norway, as part of Oslo Architecture Triennale (OAT) 26 September – 29 November 2019. *Factory of the Future*, produced by Artsadmin and METIS was developed in the UK using public funding by the National Lottery through Arts Council England with additional support from Cambridge Conservation Initiative, University of Cambridge, New Wolsey Theatre and METIS. Produced by Artsadmin and METIS.

## SEPTEMBER

Zoë Svendsen

Modes of imagining in language often reference sight – as in the words ‘vision’ or ‘envisage’. When I think of a climate-changed future, I tend to conjure images of what it might look like, whether I’m drawing on the general cultural appetite for the disaster spectacular, or translating green field sites in my imagination into vistas of solar or wind farms. I don’t think I am alone in this: our first seminar, ‘Risk’, exploring scenarios about the future of the Arctic and Antarctic, brought home the way our cultural focus on the spectacular reaches an apex with the polar regions. Given that climate change is happening fastest, most acutely, and most visibly there, the representation of these places as remote, spectacular and other is, as the polar oceanographer Mark Brandon has pointed out, not entirely helpful. To demonstrate the reality of our interconnected world he showed a map of places consumer plastics have been found in the flesh of polar bears and seals.

I was struck by this. Melting ice, that particularly potent image of climate change, is highly visible. What is not, is the complex and interlocking relations between my local landscape of industrialised farming, busy polluted cityscapes and changeable weather and that landscape of snow, silence and apparent stasis; in other words, between climate change there and a changed environment here at home. In theatre, the Stanislavskian system of acting enables a clear set of relations to be drawn between intentions, actions, and their effects. In a sense it is a mode of rendering visible (and therefore giving meaning to) why things happen. It is not an accident that such a theatrical system for structuring representation emerged alongside nineteenth-century science and Freudian theory that made even the unconscious narratable. The demand for visible, knowable relations of cause and effect is understandable in light of these cultural developments; but it may actually be

hindering us from accepting the more complex truth – the unquantifiable interconnectedness of our small everyday gestures and the macro scale of weather patterns under climate change.

Much of my artistic life is bound up with thinking about dramaturgy: the underlying structure that holds together – and produces the meaning of – what we see on stage. Rendering the systems of relation visible is part of the project, in successful dramaturgy as in thinking about climate change. This was the impetus behind the creation of World Factory, a theatre show we produced that explores our embeddedness in global consumer capitalism. In the process of making it we realised that sight/visibility isn’t enough: we need not only to see to understand, but to feel. In this show we invite the UK audience to imagine themselves as participants in the system from a position that few will have direct personal experience of: running a small Chinese clothing factory. The conditions of doing so are felt because they become the parameters within which the participants must make decisions about the factory. They are also felt in another way, through the haptic qualities of the show – the handling of money, garments and worker ID cards, and the grouping of participants around small tables.

I was struck again by the power of the haptic when, to complement our first Future Scenarios seminar, we were invited to the British Antarctic Survey headquarters in Cambridge. Holding a slice of melting ice core (280 years old and drilled up from 110 metres underground in the Antarctic) to my ear, I could hear the crackle as bubbles of air trapped before the industrial revolution popped to mingle with our CO2-doubled contemporary air.

This, then, is where the power of the scenario makes itself felt. It starts with envisaging, and draws on our powers of sight, showing us how culturally and linguistically entwined this sense is with cognition, and with our beliefs about knowledge. But its fundamental power lies in the way in which it allows us to put ourselves in the place of others – to FEEL, not only to SEE – and therefore to DO. I was hugely inspired by Future Scenarios Project Leader Renata Tyszczyk’s clever

provocation, in the ‘Risk’ seminar, where she challenged us to reimagine the original Italian ‘scenario’ in the light of climate change. Taking us back to the origins of the word ‘scenario’, Renata introduced us to these structuring documents of Commedia dell’Arte performances. Blueprints for improvisation, scenari posted up at the back of the stage indicated characters, props, entrances and exits – but only an approximate outline of what might happen. In the context of climate change, imagining future scenarios within this framework allows a concretisation of ideas that brings us much closer to how it might feel to act. As rehearsal (rather than performance), scenario-building allows us to work out how changed conditions might affect us, and who we might be under those conditions. It also opens a space for imagining the effects not only of climate change, but also of various mitigation or adaptation strategies. As economic modeller Chris Hope has pointed out, there is more work done on envisaging the climate-changed future than there is on imagining what it would be like to live in a world where successful climate action had been undertaken. Turning the tide on the rising levels of carbon dioxide in the air requires radical changes to our social, legal, political and technological infrastructure. This is where scenarios matter. Returning to terms that are often taken as metaphorical or transposed out of theatre contexts, such as ‘plot’ / ‘actor’ / ‘script’ / ‘scenario’, can invigorate future projections not only through envisioning, but through enacting and enabling – embodying the future to make it one that we would want to live in.

## Human/Nature

Emma Critchley

We decide how we want to frame our future scenarios. For centuries science fiction and space-age fantasies have shaped our impressions of the future, fuelled by imagery brought back from voyages to distant worlds. William Beebe and Otis Barton’s Bathysphere expeditions into the deep seas off the coast of Bermuda, conducted in the early 1930s, paved the way for pioneering adventurers into other extreme environments. Their first dive was also a cultural milestone. Thirty years before the world watched a man step foot on the moon through their box TV sets, people across the US and UK were able to join these two men on their mission to the deep through a live radio broadcast; their accounts conjuring images of abyssal landscapes and alien-like creatures for a public vicariously journeying with them to the deep. The men used a telephone to describe their extraordinary sights to the surface, where they would be skilfully brought to life on the page by illustrator Else Bostleman, so the world could continue living these adventures for years to come. Some forty years later, *The Blue Marble* photograph was captured by the crew of Apollo 17 on the last manned lunar mission and became one of the most reproduced pictures in human history. The depths of space revealed to us planet Earth in its entirety; at once home to billions of creatures in a living, breathing ecosystem, and a tiny beautiful orb suspended in a vast universe far exceeding the limits of our imagination. It is an image that is at once wondrous and concrete; it never fails to put human life, and the timescales we live in, into context.

The Sixties fired the starter gun for the race to the bottom of the Challenger Deep, the deepest pocket of seabed in the Mariana Trench and, as such, the deepest known point of the ocean floor worldwide. Jacques Piccard and USN Lieutenant Don Walsh made the first manned dive in their bathysphere, named Trieste, on 23rd January 1960. The descent took almost five hours, but they barely spent more than 20 minutes at the bottom, due to the minor distraction of a crack appearing in their outer window. The alarm created by this small malfunction highlights the fragility of our human existence in this extreme and alien corner of the planet. The porthole that unlocked the new world was, at the same time, a screen that separated the divers from the environment. Unable to enter, they were confined to the status of observers. As author William Firebrace notes, in Jules Verne’s *Twenty Thousand Leagues Under the Sea* Captain Nemo’s submarine Nautilus provides both an opening and a barrier between his elaborate salon spaces and the underwater environment; a place where he can observe another world from the comfort of his own armchair, and enjoy an intellectual colonisation of the deep. It is important to remember here the dangers of mistaking seeing for knowing. No less than 52 years later, James Cameron became the next guest of the deep, successfully completing a solo dive to

win the media-facing race against Richard Branson. Along with collecting samples for science, Cameron's main mission was to gather footage – images with the power to immerse the rest of the world in unfathomable depths, in eye-wateringly high definition, from the comfort of a cinema seat. Following Cameron's successful solo dive, Virgin Oceanic's rival project, the Deep Flight Challenger submarine, was quietly shelved, having previously been described as 'the last great challenge for humans.' Perhaps in the wake of Cameron's achievement, Virgin Oceanic considered the challenge insufficiently interesting to replicate.

Despite these early deep-sea endeavours, to this day more people have been into space than lived underwater to pursue science, as is explained in the BBC series on people who have already 'experienced the future' (BBC, 2014). It is interesting to consider why. Today it is proposed that space tourism may only be a year away; indeed, tickets for human flights in Earth's orbit are already being sold for the princely sum of \$250,000. The draw to space is compelling; programmes like Mars One have hundreds of people applying for a one-way mission which, as they state on their website, would be 'the worst kind of punishment' for anyone lacking a keen interest in going to Mars. Once on the red planet, there are no means to return to Earth. When compared to the extreme and permanent self-exile of the near-future Martian colonists, Jacques Cousteau's ideas of living in underwater colonies seem somewhat staid. The deep seas are, nevertheless, not much less hostile, nor much more alien to human understanding, than is the surface of Mars.

Although there are a handful of undersea habitats in design, there is only one currently in existence: Aquarius Reef Base in Florida Keys. Scientists mainly see living underwater as important for research and education, but there are also arguments about the significant role these environments could play in potential future scenarios: providing habitable space in our over-populated world, or in the aftermath of a global catastrophe. Innovation Consultant Philip Pauley has designed 'Sub-Biosphere 2' as a long-term base for aquanauts, tourists, and scientists of marine life. However, the project has slightly darker undertones as well, as it is designed to house a global seed bank and exactly one hundred people – the number it is believed we will need to re-populate the Earth if an event wipes the rest of us out. Interestingly, Pauley is seeking a publisher for a science fiction trilogy that he has written to raise interest and support for his underwater habitat. The deep sea is considered quite as worthy of sci-fi treatment as any extra-terrestrial location.

In 1972 Ian Koblick opened La Chalupa, the largest, most advanced underwater habitat and research facility in the world at the time. Koblick now thinks that the 'only real motivation [to build underwater habitat facilities] is if we destroyed the air environment up here and were forced to leave because we couldn't live in it ... or we started picking up gold nuggets from the bottom. Then it would be done in a heartbeat' (BBC, 2013). Inevitably, it takes more to propel us into these remote places than the mere pursuit of fantasy. Here again

it is important to look back as well as forward, as the uncomfortable relationship between exploration and exploitation that recurs so often in our pioneering past is on the cusp of being repeated in the future. Though it is certainly true that exploration also drives genuine progress. The novelist Margaret Drabble argues, for example, that *Twenty Thousand Leagues Under the Sea* anticipated the ecology movement (2014). As with many ambitious human endeavours, the results can be helpful or harmful, but will no doubt be complex.

The infamous Jacques-Yves Cousteau opened up human ocean exploration to the masses through his films, books, and TV series, along with co-inventing the aqualung that has allowed thousands of divers to physically experience the magnificent underwater environment first hand. There is no doubt that Cousteau had a deep passion for the oceans and was vocal about protecting them from the impact of human pollution, but there was another driver behind his work – his funders. Most of Cousteau's environmental and marine survey research was funded by the oil and gas industries and the technologies invented were used to search for minerals. In 1954 Cousteau in fact conducted a geological and hydrographic survey of the Arabian Gulf seabed on his ship *Calypso*, identifying drilling sites, which was the first phase in an exploration programme that eventually led to the discovery of oil in that region (Morton, 2015).

Another iconic ocean expedition from our history books is the great HMS Challenger (1872-1876). The only extensive voyage of its kind planned explicitly to gather data from the oceans, it made many discoveries that laid the foundation of oceanography today, but it was in fact set in motion by the telecommunications industry. The first submarine telegraph cable laid across the English Channel in 1851 triggered a boom in telegraph communication, and simultaneously prompted a realisation in both the government and cable companies that knowledge of the seabed was critical to the development of the industry. The Challenger's epic voyage received national funding in the name of better understanding the depths of the oceans, but it simultaneously ensured that expensive cabling could be laid down properly, opening up the possibility of connecting continents by near-instant means of communication.

History has taught us that we tend to anchor our thoughts in what we know; we have to presume a certain present to be able to think about the future. So it is important that we challenge our present scenarios. The current industry driving ocean exploration is deep-sea mining. Amongst other riches, the sea floor contains rare earth minerals, which are used to power emerging and 'next generation' technologies: electronics, batteries, computer chips, mobile phones, chemical sensors, cancer drugs, flat panel displays, solar panels... the list goes on. According to a 2011 article in *Nature*, demand for rare earth minerals has leapt from 30,000 tonnes in the 1980s to about 120,000 tonnes in 2010 – higher than the world's (then) current annual production of about 112,000 tonnes (Kato et al., 2011). These raw materials make up the screens that frame so much of the world we see today. The fabric of the portals that immerse us in our fantasies is contained in the abyssal depths from which they came.

Deep-sea mining is evidently a contentious issue. Scientific communities are struggling to keep up with the pace of movements in industry. Without sufficient baseline data of deep-sea ecosystems, it is very difficult to manage and protect this terrain. We simply don't know enough about the environment that covers the majority of the planet to understand the real impacts of mutilating it. There is also the question of who has the right to the resources. Much of the territory we are talking about falls outside the areas of national jurisdiction and is thus classed as the Common Heritage of Mankind. And as with the Moon, the interpretation of what this actually means is somewhat vague, and mediated by a very small group of people. As Dr Kerry Howell beautifully points out, with the Antarctic, its status as the Common Heritage of Mankind is interpreted as 'no-one should go there', whereas with the oceans it is interpreted as 'everyone has a right to benefit from its resources'. The Outer Space Treaty adheres to the same principle. In May 2018 the *New York Times* commented that 'Earth-based mining companies may soon face stiff competition from the mining of gold, silver, platinum and rare earths on asteroids and even other planets.' In a conference on Space Law and the UN Treaty in 2017, the designation of space as the Common Heritage of Mankind was framed as a hindrance to space exploration. One comment from the floor was: 'I'd like to see the treaty changed from space exploration to space exploitation'.

The future scenarios of both the deep sea and space inevitably appear to be rooted in mining, and with this there is the potential that their remote and wondrous allure may eventually fade. There have been very strong warnings in a lot of the research I have done around deep-sea exploration and the foreseeable exploitation that follows. We simply don't know enough about this epic frontier and its inhabitants to blindly move in. An anecdotal forewarning comes from William Beebe's biography. As an experiment for one of his pioneering dives he tied a lobster to the outside the Bathysphere as bait, or in his words 'a sacrifice upon the altar of oceanography'. On returning to the surface after a dive to 2200ft it was reported that the lobster was 'more active than when it was sent down.' Take heed, there's much we don't know of the deep.

*Common Heritage* (24:57 minutes, HD, sound, 2019) is a film that was conceived during the Culture and Climate Change residency programme. The film's production was funded by the Jerwood Charitable Foundation. *The Space Below*, a collaboration between artists Emma Critchley and Lee Berwick is currently in production. It was conceived as an immersive sound installation, designed to tour to subterranean locations across the globe, where the cause and impact of underwater acoustic pollution are most prevalent. It is inspired by extensive research during the Culture and Climate Change residency programme with scientists and specialists in the field, including close collaboration with The British Antarctic Survey's Ecosystems Programme and Wildlife Ecologist Dr. Iain Staniland. *The Space Below* project partners include: The British Antarctic Survey, The Hebridean Whale & Dolphin Trust, Culture & Climate Change, Californian Ocean Alliance, The University of Plymouth, and specialists from Cornell and Washington Universities, US.

## MARCH

Emma Critchley

I am currently preparing to go to Chile where, amongst other things, I will be going to the Atacama Desert to do some filming for Human/Nature. I have been granted permission to film in the Atacama Large Millimeter/submillimeter Array (ALMA) – the world's most powerful observatory for studying the universe at the long-wavelength millimeter and submillimeter range of light. ALMA sits at five thousand meters above sea level and is designed to find some of the most distant, ancient galaxies, and to probe the areas around young stars for planets in the process of forming. One of the aims of the filming will be to explore how astronomy shapes human imagination, which has in turn fuelled both deep sea and space exploration. As described on their website, ALMA opens 'an entirely new "window" on the Universe, allowing scientists to unravel longstanding and important astronomical mysteries, in search of our Cosmic Origins'. I'm also interested in the fact that ALMA is an international partnership of the European Southern Observatory, the U.S. National Science Foundation and the National Institutes of Natural Sciences of Japan, together with NRC (Canada), NSC and ASIAA (Taiwan), and KASI (Republic of Korea), in cooperation with the Republic of Chile). To me in this light, the group of antennas become a visual metaphor for global collaboration. I will also film in the Atacama Desert itself – the driest non-polar desert in the world. So much so that a team of scientists from NASA, the Universidad Nacional Autonoma de Mexico, Louisiana State University, and several other research organizations have used the Atacama Desert to investigate why NASA's Viking missions to Mars in the 1970s failed to detect life in the soil. The expedition's principal investigator Dr Chris McKay said, "In the driest part of the Atacama, we found that, if Viking had landed there instead of



on Mars and done exactly the same experiments, we would also have been shut out.” Hence the Atacama has become a valuable test bed for developing instruments and experiments to find microbial life on Mars – another rehearsal space for a future scenario.

We have been asked this month to think about the 1.5-degree target set at the Paris accord in relation to the scenarios we’re exploring during the residency. Naturally my thoughts initially turn to the Atacama landscapes I’ve been researching, as for the most part the desert only receives rain every ten years, and some areas have not received a drop of rain in hundreds of years. Most of the landscape is composed of stony terrain, salt lakes and sand, which are perhaps images that may become more familiar to us in the future, even with only a 1.5-degree increase. Perhaps the research that is being done for Mars will become increasingly applicable to the soil on Earth, and the Atacama Desert will become a testing ground for developing technologies that allow us to generate genetically modified crops in extreme environments.

It has been useful to think about this 1.5-degree target in relation to the concepts behind the Common Heritage of Mankind (CHM) principle, which has become the crux of the Human/Nature project. The CHM principle states that the natural resources of the deep seabed and of outer space are held in common by all nations, and should be distributed equitably for the benefit of all humankind. It was the Ambassador for Malta who gave the inspirational 1967 UN conference speech that instigated the development of the treaty, which he argued was essential in light of the ‘last century’s colonial scramble for territory’ and ‘sharply increasing world tensions’. The development of the CHM is an opportunity to revolutionise history and bridge the gap between developing and developed nations, through sharing the world’s resources as a common heritage of mankind. In the same way that the CHM principle was initiated by the insight of a small island in the middle of the ocean witnessing first hand the sudden ‘exploration’ of rich

mineral resources in the deep ocean floor, it was the most vulnerable nations who led the call in Paris for a 1.5-degree target.

However, how these global average targets are calculated and set is a highly political issue, which relies on judgment values around risk and danger. Scholar Joni Seager discusses how notions of acceptability always mirror ‘a prism of privilege, power, and geography’. The 1.5-degree figure works on a global average, which is a scenario that no individual person or species will encounter. Archbishop Desmond Tutu spoke at the Copenhagen COP (2009) about the fact that a 2°C global average would mean 3°C–3.5°C or more for Africa, which creates scenarios that are somewhat off the scale of the more commonly 1.5–2°C implications described. In her paper published in 2015, Petra Tschakert of Penn State University discusses how the risk will be unevenly distributed with ‘higher risks and earlier impacts for socially marginalized groups, the elderly and children, and outdoor workers, as well as for people who may shift from transient to chronic states of poverty’. This vitally important discussion complicates the already difficult task of imagining what this future might look like. But it also highlights the importance of international dialogue in order to help us exercise our imagination.

## Future Scenarios: Anthroposcenery and Memories of the Future

Lena Dobrowolska Teo Ormond-Skeaping

Our project *Future Scenarios* explores humanity's vulnerability to and responsibility for climate change, and the role that narrative plays in shaping our future. *Future Scenarios* is a multifaceted body of work that includes a three-screen artist film installation and documentary photographic works.

In producing these works we collaborated with leading climate change scientists, researchers and policy makers in the Global South and the United Kingdom. These stakeholders showed us how the narrative of vulnerability that once surrounded nations already experiencing severe effects of climate change has since evolved into a narrative of resilience and adaptation. These countries, most susceptible to the effects of climate change and once thought of as helpless, are now emerging as leaders in the development of mitigation and adaptation strategies, the use of indigenous resilience and adaptation knowledge, research into loss and damage, knowledge sharing, and the use of renewables. These nations are leading the world in decarbonising their economies, even though as a group they have contributed the least to total global carbon emissions. Meanwhile, the developed nations that are principally responsible for climate change, and that have far more technological and financial resources to tackle it, seem to be stuck in a state of political apathy and are making little progress towards mitigation or adaptation.

By foregrounding this new narrative of resilience and adaptation, we reveal how this story opens up a dialogue about a still yet-to-be determined future. This dialogue proving effective in combating a fatalism which, if left unchallenged, would only compound the victimhood of those most vulnerable to climate change.

Through our captioned photographic work we present evidence of this shifting of the narrative toward resilience. We record signs of this resilience, among those most affected by climate change, and document some of the knowledge generated by their resourceful and purposeful responses to climate change crisis. We also note the historic responsibility of Developed Nations for climate change, their inadequate and sluggish responses to it, and the relationship between colonialism and climate change. Each photograph is accompanied by a caption that tells the story. Three examples of the captions follow:

Caption for photographic work: *Portrait of resilience #1, Luang Namtha province, Lao PDR*, Giclée print from digital medium format, 90x120cm, 2017.

*Climate change is a magnifier of gender inequality: climate change is likely to adversely affect women's social roles, rights and agency, because they are often*

*poorer and often dependent on men. Although often perceived as incapable due to their low status, women are increasingly understood to play a significant role in mitigating and adapting to climate change. Women often play a crucial role during times of disaster by leading their family to safety, and afterwards devising ways to support, nourish and shelter their children and other relations. In recent years developmental strategies have shifted to focus more and more on the role of women and their empowerment. Many NGO's and researchers found that, where interventions relating to education, environmental protection, sexual health and disaster preparedness had failed to enact positive change when targeting the male population of a community, success came through working with the women, who could often greatly influence their husband, sons and community leaders.*

Caption for the photographic work: *Waste tire, Devon, United Kingdom*, Giclée print from digital medium format, 90x120cm, 2017.

*The United Kingdom has arguably the longest-lived historic responsibility for climate change, being the first country to industrialise and to emit large quantities of anthropogenic greenhouse gasses. However, greater than any one nation state's impact is that of the transnational petro-industrial complex, driven by globalised capitalism. Following the devastation wrought upon the Philippines by Typhoon Haiyan in 2013, the government started to investigate the liability of 50 of the biggest fossil fuel companies for violating the human rights of Filipinos by contributing to catastrophic climate change. This is an important instance of a growing trend among those countries that are experiencing the most intense early effects of climate change. The environmental justice framework is being brought into play to challenge corporate drivers of climate change and deliver compensation to those most affected. In 2017 Greenpeace and Norwegian environmental organisation Nature and Youth challenged the Norwegian government in the Supreme Court of Norway for allowing oil companies to drill for new oil in the Arctic after signing and ratifying the Paris Agreement. The Government was found not liable on 4th January 2018, and on 5th February 2018 Greenpeace Nordic and Nature and Youth appealed the judgement. The legal case against the Norwegian Government is ongoing.*

Caption for the photographic work: *Ration distribution, Bidi Bidi Refugee Settlement, Yumbe District, Uganda*, Giclée print from digital medium format, 90x120cm, 2017.

*The country of Uganda currently hosts over 1.1 million refugees from as many as 10 countries, with the largest numbers fleeing from South Sudan, The DRC, Burundi, Rwanda and Somalia. In 2016-17 Uganda accepted more refugees than any other nation and now has one of the largest refugee populations in the world, even though it is itself an LDC with a history of conflict. Uganda's outstanding emergency response to the crisis in South Sudan is an example for the UK, USA*

and Europe to aspire to, and a lesson in how to treat refugees better. As Titus Jogo, the refugee desk officer at the Office of the Prime Minister in Adjumani, states: "You never know when you too may become a refugee". Climate change is expected to exacerbate conflict, severe weather events, drought and flooding in the coming years and decades, and, as such, is likely to displace increasing numbers of people worldwide.

Working with scenarios thinking we have pursued indexical photographic and cinematic representations of current climate change phenomena with the intention of suggesting a palpable imagining of both difficult and improving climate change future scenarios.

Naomi Klein sums up this future thinking approach in her book *No Is Not Enough: Defeating the New Shock Politics*. Klein says: 'There have been times in my reporting from disaster zones when I have had the unsettling feeling that I was seeing not just a crisis in the here and now, but getting a glimpse of the future — a preview of where the road we are all on is headed, unless we somehow grab the wheel and swerve' (2017). To which we would add that we have seen not only crisis in the here and now, but also creative solutions and causes for celebration.

In locations historically responsible for climate change, such as the UK, and in places already feeling the most intense effects of it, like Bangladesh, we have investigated scenarios of climate-induced migration, intensified natural disasters, sea level rise, energy futures, conflict, heat and water stress and food security. In all of the locations that we worked, we were humbled by the resilience, heroic actions and generosity of the people that are being affected most by climate change. We quickly understood how misleading the label of vulnerability is when applied to the people who hosted us. It was we, the interlopers, who felt precarious — inadequately prepared for the heat, the workload and the living conditions.

In our *Future Scenarios* film, we present a loose imagining of the remainder of the present century. Tracking four sets of speculative events that unfold along multiple pathways to the future, we imagine alternative scenarios. The speculative events were imagined in response to both Shell's recent New Lens scenarios — 'Mountains' and 'Oceans' — and The United Nations Framework Convention on Climate Change's RCP scenarios that vary from a 1.5°C to 6 °C predicted temperature rise by 2100. We have presented a coloured dot instead of a defined temperature marker inviting the viewer to imagine what the future may hold, as they subjectively interpret what temperature increase the four dots from yellow to dark red signify (2020-2039 yellow, 2040-2059 light orange, 2060-2079 dark orange, and 2080-2100 red).

'Anthroposcenery' is the backdrop against which the events of the Anthropocene may take place. Working with our film footage (and still photographs) as Anthroposcenery from the future we wish to suggest how scenarios can be considered memories of the future. As Shell's Scenarios team point out, 'thinking about the future uses the same part of the brain as thinking

about the past or past memories' (www.shell.com). Knowing that thinking about the future is limited when we use past precedents to imagine it, we intend our film to challenge its viewers to imagine different scenarios by becoming aware of and understanding multiple, perhaps sometimes contradictory, perspectives. By working with three screens we present different perspectives on events that unfold along multiple scenario pathways. In this way we frame the future as undecided, the actual outcomes still within the influence of the unknown off-camera protagonist to whom these future memories might possibly belong.

The use of different lenses on an issue, also known as frameworks, is common in scientific research, journalism and documentary. This is important, because lenses shape the way we view the world, and therefore how we interact with it. Though these lenses are not physically represented by a change in focal length, we intend our three-screen installation to encourage viewers to think about how we frame the world, be it through an environmental justice lens, a Neo-Malthusian lens, or a technocratic lens. How does adopting one or another of these frameworks shape the way we imagine our future?

By describing climate change as what Timothy Morton has dubbed a 'hyperobject' — 'an entity that is so massively distributed in space and time that you can't point to all of it at once' (2013) — we intend to disrupt familiar climate change narratives, skew the responsibility/vulnerability divide, and reveal the unequal power relationships that are inherent to climate change. We wish to draw attention to the fact that we are all responsible for, and all vulnerable to, climate change. Of course humans are not equally responsible; nevertheless, we all have a carbon footprint, and therefore we all have a role to play in tackling climate change.

Operating as a collaborative cross-disciplinary investigation, *Future Scenarios* considers how we may represent climate change through photography and artist film, and how we may 'decolonise nature' (Demos, 2016). Ultimately we believe that to decolonise social and natural environments and begin to envision habitable futures we need to look afresh at the problem, and perhaps unlearn old ways of seeing. Although we know not what the future may be, we hope that the future will remain open to all, and that we will find solidarity in our shared confrontation with the complex and unstable realities of climate change.

*Future Scenarios* is an ongoing project. So far it has been produced in the Lao PDR, Bangladesh, Nepal, the United Kingdom, Uganda, and the United States. Our travels to these locations happened between 2017 and 2019, following our participation in the year-long Culture and Climate Change Future Scenarios Residency programme, 2016-17. The Residency explored the idea of artists working as climate change researchers by connecting us with a network of researchers, NGOs, policy makers and institutions, including the British Antarctic Survey, the Scott Polar Museum, the Tyndall Centre, the International Centre for Climate Change and Development in Bangladesh (ICCCAD), the IIED, UNHCR, Jesuit Refugee Service, and the Louisiana Environmental Action Network.

## APRIL

Lena Dobrowolska &  
Teo Ormond-Skeaping

We are currently preparing for our visit to Bangladesh. During the month-long field trip we will be working with The International Centre for Climate Change and Development (ICCCAD) in Dhaka following an invitation by Saleemul Huq. With the support of Nadine Suliman, a researcher in residence, we will collaborate with ICCCAD to understand the formal and informal adaptation strategies that Bangladesh has developed to mitigate climate change.

By visiting Bangladesh, a nation that is already experiencing the climate change reality which for many nations is still a future scenario, we hope to gain a greater understanding of how vulnerability can be turned into adaptation and how climate change action can strengthen development.

Our photographic and film work in Bangladesh will continue to focus upon the future scenarios of climate-induced migration, conflict, water stress and food security. However, we intend to expand upon the usual gamut of notions and imagery surrounding the narrative of vulnerability by foregrounding the following ideas:

- The need for environmental justice.
- The need to shift the representation of the most vulnerable nations from a fatalist narrative about vulnerability that compounds victimhood to a narrative about resilience and adaptation that opens up a dialogue about a still yet-to-be determined future.
- The need to recognise that the nations most vulnerable to climate change are now the leaders in the development of adaptation strategies and the switch to renewables, and as a result are closest to decarbonizing their economies.
- The need to displace climate change by creating a narrative that does not focus upon one place.

In order to foreground these ideas we have developed several new strategies that we will be trialling in Bangladesh alongside our already established methods. These new strategies have been developed following the consideration of how we could make our methodology more inclusive and less extractive. This topic was discussed in a recent conversation with Poshendra Satyal about how he is trying to use more inclusive research methodologies in his fieldwork for the CoCooR project (2014-2018), and with fellow artist-in-residence Emma Critchley, who introduced us to the idea of research fatigue. Research fatigue is the idea that community members feel exhausted or overwhelmed by being the subjects of research – particularly when they do not see tangible results from research activities. One of the strategies that we will be trialling in Bangladesh, we have aptly dubbed the ‘scenario methodology’. Working with our gimbal-stabilised point-of-view camera, we will invite different groups from different communities to participate in a scenario with us. For example:

**Scenario #1:** A future Bangladesh sues ExxonMobil

**Props:** A future newspaper headline or news report voiceover

**Community group:** Law students at the University of Dhaka

**Method:** Ask a group of university students to respond to the idea that a future Bangladesh would sue ExxonMobil for damages done to the nation as a result of climate change.

Prior to the performance, a conversation should be held about who is culpable for climate change, and the implementation of environmental justice through the repayment of carbon debts to vulnerable nations, with the intention of mitigating climate change.

The aim of this scenario is to explore the idea of a relationship of causation, and perhaps culpability, between the damage done to Bangladesh by climate change and someone else’s carbon-intensive activities. The scenario is also intended to empower those participating in the performance, reversing the power dynamic of

camera and subject as the performers appear to directly challenge, indict or educate the viewer.

Other scenario ideas explore such subjects as informal adaptation in slum areas; future geoengineering in Bangladesh; work for climate migrants; the rickshaw economy; a cyclone shelter re-enactment; domestic adaptation; salt- and flood-resistant agriculture; and a water-world Bangladesh.

In the leadup to our participation in the 2 Degrees Festival at ArtsAdmin in London in June, Renata Tyszczyk suggested we all reflect upon the 1.5C goal ratified by the Paris Agreement. As artists examining the politics of climate change, we share the view of the Climate Vulnerable Forum, expressed in the words of Saleemul Huq:

Even if it may not be achievable, 1.5°C is the right goal to have. It is what we should, as leaders, agree to in Paris. While 2°C as a long-term goal is safe for many countries and many people, it is not safe for all countries and all people. And so if we want all countries and all people to be safe, we need a 1.5°C goal. The global leadership meeting in Paris that adopts a 2°C goal will knowingly be writing off many people. And many of those people are from the countries represented here and saying to them, “We cannot protect you because it’s too difficult for us to make the emission cuts that are necessary to protect you, the most vulnerable people on planet Earth”, that’s a bad decision for world leaders to be making. The reason for pushing the 1.5°C goal is not whether it’s feasible and possible – we know it’s going to be difficult – but whether it is morally correct or not.

Therefore our work with scenarios is based upon achieving this goal. Huq’s statement was made during the Climate Vulnerable Forum summit in Manila, the Phillipines, on 9th November 2015.

# Twelve scenarios

## The First Climate Scenario: A Drama in Three Acts

*Mike Hulme*

The first scientific paper using the terminology of ‘scenario’ to describe the possible future evolution of climate was published in 1977 by the German meteorologist Hermann Flohn. It appeared as the first paper in the very first issue of the new journal *Climatic Change*, published by Springer and edited by the ambitious young American climatologist Stephen Schneider. In this short essay I look back at this paper from the perspective of more than 40 years of ‘climate scenarios’, and find in Flohn’s presentation some important lessons for thinking about and using scenarios today.

Flohn framed his analysis of future climate in the context of the 1970s energy crisis, and took inspiration from the Club of Rome’s 1972 report *The Limits to Growth*. In the mid-1970s it was very far from agreed among scientists that the world was warming, let alone that the prognosis was for future warming (National Defense University, 1978) — yet Flohn, in a series of bold moves, brought together concerns about future energy, economic and population growth and the presumed human influences on climate to speculate about the climatic future.

‘It is intended to ventilate here some possibilities of near-future climatic evolution based on the most recent state of knowledge. This can never be a forecast — rather it is a perspective, a scenario outlined after many discussions among many leading experts ...’ [p.10].

There are several notable qualities to the reasoning and style of scenario presentation that Flohn adopted back in 1977. First, he was very clear about the *synthetic* and *subjective* qualities of the future he was creating. Flohn assimilated evidence and reasoning from different domains of knowledge—energy projections, energy technology, demography, paleoclimate science, the nascent field of climate modelling, and so on—to create “a perspective” on future climate, certainly not a forecast or a prediction. It was fully acknowledged as a subjective assessment, eschewing any claims to special or privileged knowledge of the future: ‘the author, however, takes the responsibility for its wording alone’ [p.10].

Second, he explicitly worked with the original dramaturgical meaning of the Italian word ‘scenario’, meaning a sketch of the plot of a stage play. Flohn presented his climate scenario “in three acts”. Act 1 was to be the beginning of the twenty-first century (that is, now!), in which world climate had warmed to resemble the warm climate of the 1920s and 1930s (cf. Kincer, 1933). Act 2 was set in the middle decades of our present century — the 2040s and 2050s — which would more resemble the ‘warm epoch’ of the Earth between 800 and 1200 AD. Arctic sea ice would be in retreat and desert margins destabilised. The third and final Act of Flohn’s drama — the close of our century — would witness global conditions warmer than the last interglacial period 200,000 years ago, and possibly warmer than any time in the last 1-2 million years. In Act 3, the Arctic was largely ice-free in summer, with attendant changes in mid-latitude and tropical weather circulations.

The third notable feature of his analysis was how he used his creative scenario to pose questions about the energy future: ‘What does this three-act [climate] scenario with its alarming inferences mean for the energy problem?’ [p.17]. This contrasts with much subsequent scenario work in the field which inverted Flohn’s question: what do different energy futures mean for climate? Flohn drew two conclusions from his climate drama: a reduction in economic growth; and a future powered by solar energy, ahead of nuclear and fossil fuels. Using the voice of the prophet calling a society to heed its covenant values (cf. Walsh, 2013), Flohn warned: ‘It is our generation which bears responsibility for a global scale problem facing our grandchildren - let us take care to match it’ [p.18].

In the 40 years since Flohn’s publication, climate scenarios have gained great salience, but they have also taken on very different forms to that presented by Flohn. A clutch of climate scenario papers followed around 1980 — Kellogg (1978), Williams (1980), Wigley et al. (1980) — all of them using past climates as analogues for the future. But through the 1980s and 1990s the growing dominance of global climate models in the study of climate change meant that by the time the IPCC reviewed the whole field of climate scenario production in 2001 (Mearns & Hulme, 2001), the ‘art’ of scenario creation had been largely superseded by technical considerations and an excessive emphasis on numerical objectivity. Confusions between the language of climate ‘scenarios’, ‘forecasts’, ‘projections’ and ‘predictions’ abounded (Bray and von Storch, 2009).

And we are still today in a place of ambivalence. Is a climate scenario a provocation to think imaginatively, but seriously, about the relationship between present actions and the future? Or is a climate scenario revealing objective and authoritative knowledge of the future? Is a climate scenario a scientific technical accomplishment to be admired, or a prophetic call

to rethink and react based on a moral vision? Reno Knutti recently lamented the scientisation of climate scenarios associated with the speculative geoengineering technologies of carbon dioxide removal and (especially) solar radiation management, calling it ‘computer modellers using scenarios as Trojan horses to drive a geoengineering agenda’ (Knutti, 2018: 214). Scenarios should never offer what is ‘most likely to happen’ and they should caution against implied objectivity. The ambiguity of scenarios works in different ways. Will Steffen and colleagues’ recent invocation of a ‘hothouse earth’ (Steffen et al., 2018) has echoes of Act 3 in Flohn’s 1977 scenario. Yet while Steffen et al. describe this outcome as ‘an extreme scenario’, its narrative lacks the explicitly subjective and exploratory qualities offered by Flohn.

Scenarios are not coercive devices to corral subjects into a determined course of action; like any art form they are provocations to their audience to reflect and to see the world differently. The consequence of such reflection is beyond determining. ‘Scenarios help us explore options rather than [focus] narrowly on what is most likely to happen’ (Knutti, 2018: 214).

## Convey's Law

Tony White

I coined the term Convey's Law — after the UK Antarctic scientist Dr Peter Convey — to describe a climate change scenario-building concept that was suggested to me by a telephone conversation with Dr Convey: the deceptively simple idea that in order to understand or conceptualise climate change futures, one must look at how things are responding to change now.

I interviewed Dr Convey in 2008, and he was talking about the effects of climate change on the simple terrestrial ecosystems and limited flora of the Antarctic Peninsula — lichens, one grass, and one rockery plant — but the concept might also be used to examine the ways that human, social and political organisations, discourses and institutions are responding to change now. How are we responding to change now, one might ask (and who is 'we'?). This question could include responses at personal, domestic or local levels, or the way that societies are responding to wider geopolitical change — with, for example, Brexit; new immigration policies; privatisation; or the erosion of civil society and the public sphere.

The interview and this concept are discussed in more depth in Chapter 11 of my novel *Shackleton's Man Goes South* — 'Antarctic Scenarios V: Convey's Law' — which was published by the Science Museum as their Atmosphere Commission of 2013, the first novel that the Science Museum has ever published.

*Shackleton's Man Goes South* explores historical and contemporary climate change scenarios and science fiction forms. The novel was broadly inspired by — and explores the implications of — a science fiction story about climate change that was written in Antarctica in 1911 by Captain Robert Falcon Scott's surviving meteorologist, George Clarke Simpson. The story was collated in a shipboard newspaper called *The South Polar Times* — each edition in reality a kind of one-off scrapbook — that had been inaugurated by Sir Ernest Shackleton on an earlier expedition. Simpson would go on to research climate change throughout a distinguished career that included his being the longest serving director of the Meteorological Office, then a part of the UK's Air Ministry.

*Shackleton's Man Goes South* is a documentary novel, one that combines fiction and non-fiction elements in a structure loosely derived from the French author Georges Perec's semi-autobiographical Holocaust novel, *W, or the Memory of Childhood*. The fictional elements of *Shackleton's Man Goes South* take the form of a ballad opera — a format used here for its capacity to incorporate satirical and topical content — but rendered in prose.

The story was initially plotted or sketched using the cut-up technique of William S. Burroughs and Brion Gysin, collaging texts derived from two sources: the *Special Report on Emissions Scenarios* (SRES) documents published alongside IPCC AR4 in 2007; and the caption cards from Frank Hurley's 1919 silent film *South*, which documented Sir Ernest Shackleton's famous failed Antarctic expedition of 1914–16, and the resulting heroic feat of rescue. My use of this cut-up procedure, as a means of remixing contemporary scientific and policy language with that of the Edwardian melodrama, was born of a dissatisfaction with the basic premise of the SRES process. Every scenario pathway was based on an assumption of continuous economic growth, which I found contentious since it limited the range of scenario options being considered, and was at odds with the global financial crisis that was then unfolding; furthermore, the scenarios it produced were inert and ineffective, communicating little to the reader. I wanted to see if other, more compelling types of climate change scenario might be developed out of the scrambling and recombining of two very different types of document. The text fragments that this cut-up process produced were short poems that evoked climate change-driven migration. They are retained as epigraphs within the finished novel. During composition they functioned as a kind of armature around which a new story could be sculpted.

If the cut-up technique is one scenario-building device, in *Shackleton's Man Goes South* I also made use of the satirical/carnavalesque strategy of turning the world upside down, flipping the polarity of the Shackleton myth to tell the story of climate change refugees, Emily and her daughter Jenny, who are fleeing to Antarctica instead of from it, in a hot world instead of a cold one. They travel with a human trafficker named Browning. When we first meet them they are making landfall at Patience Camp, a vast refugee camp on the South Atlantic island of South Georgia, the last staging post on the new migratory routes to Antarctica. In the slang of their post-melt world, Emily and Jenny are migrants known as Mangoes, from the expression 'Man go south.'

Intercut with Emily and Jenny's story are a series of interviews with climate scientists including Dr Mark McCarthy of today's Met Office, as well as paleo-botanist Professor Robert Spicer of the Open University, and — of course — Dr Peter Convey of the British Antarctic Survey. The interviews chart changing expectations of our own proximity to dramatic climate change, on a declining gradient from the tens of thousands of years in the future suggested by Simpson's 1911 science fiction short story, through millennial, century or decadal timescales, to — in Convey's formulation — the present day.

It is inevitable that within the novel these fictional and non-fictional worlds meet, in climate change scenarios developed according to Convey's



Law. In the ‘now’ in which the novel was written, the policies and systems that allowed legalised torture as part of the so-called War on Terror were being developed, and the practice of indefinitely detaining migrants was becoming normalised. These phenomena therefore make their way into the novel. According to Convey’s Law, the development and prosecution of such policies and systems should itself be seen as a form of climate change adaptation.

Tony White’s novel *Shackleton’s Man Goes South* (Science Museum, 2013) can be downloaded in full from <http://bit.ly/goessouth>

## I’ve had enough of scenarios

*Alex Kirby*

I’ve had enough of scenarios. They’re so twentieth century. That’s when I started writing about climate change, back in the 1980s. Those were the days when a senior editor told me he wouldn’t use a climate story I’d written, because although it was July the weather was cold enough for him to have to wear an overcoat, so obviously climate change wasn’t real.

That was just about understandable back then, when for most of us climatology was a new science, and a still unproven one. It isn’t now. At the Climate News Network we’ve been publishing (at least) five news stories a week since we started in 2013, and time and again we find ourselves linking back to those early stories which reported, years ago, that what now has happened would happen.

That’s why I’ve had my fill of scenarios. The word is ambiguous, tentative, suggesting that “on the one hand...but on the other” is lurking in the thickets of the next paragraph to reassure us that we’re right to doubt, to withhold judgment and to refuse to act.

That’s not the reality of climate change 30 years on from my shivering editor. The reality, we now know, is that there’s too little time to avoid really serious change: all we can do is to try so far as we can to tame the gathering storm and to adapt to what is unavoidable.

You want numbers, percentages? Okay. The Paris Agreement of 2015 is a global treaty on tackling climate change, signed by 197 of the world’s governments and ratified so far by 176 of them. They agreed to keep global temperature rise this century well below 2°C over pre-industrial levels, and to try to limit the increase to a maximum 1.5°C.

All well and good, you may think. But in the last century the Earth’s average temperature has already risen by about 1°C — halfway to the more modest Paris limit, two thirds of the distance to the more stringent goal. UK scientists say the world may exceed a 1.5°C increase by 2023.

And researchers have found that if the global temperature does rise by 2°C, then the number of people affected by multiple climate change risks could be the number affected by a rise of “only” 1.5°C.

So just 0.5°C more heat in the system will spell catastrophe for millions of the world’s poorest people. That’s not a scenario, a possibility, a conjecture which perhaps we may need some day to take into account. Given the heedless profligacy with which the world is continuing to burn fossil fuels, the immense quantities of carbon dioxide stored in the oceans which are still to reach the atmosphere, and the rate at which the polar ice

is melting in both Arctic and Antarctic, the prospect of breaching the 1.5 limit one day soon sounds more like a racing certainty.

If we want to communicate the reality of climate change, that is the message we should be sharing. If we call it a scenario, many of those we want to reach will assume there's no urgency, no need to think of doing anything for a decade or two, or three. We need to tell them these are the scientists' findings, and their conclusions are the outcomes for which we should be preparing. If we are not willing to do that, then we should stop imagining that we are communicators.

The Climate News Network publishes a daily news story on climate and energy. It is run by four volunteers, all veteran climate journalists: Paul Brown, Kieran Cooke, Alex Kirby and Tim Radford. The site is open to everyone at [climatenewsnetwork.net](http://climatenewsnetwork.net).

## Integrated Assessment Modelling

*Chris Hope*

The work I do goes by the name of Integrated Assessment Modelling of climate change. It is quite detailed, technical analysis. But it feeds strongly into the world of storytelling, of creating a narrative that can be understood, interrogated and adopted as a guide to action if it is found to be convincing.

Over the last 25 years, the PAGE model that I created has been used to calculate the benefit of an immediate reduction in the emissions of greenhouse gases such as carbon dioxide and methane; to compare the costs and impacts of policies to tackle climate change; to evaluate the uncertainty around central estimates of costs and impacts; and to direct policy makers' attention to the value of further research to reduce uncertainty. PAGE stands for Policy Analysis of the Greenhouse Effect.

What kind of story does the model enable you to tell? At its core, it says that if you believe the best information provided by the most expert scientists and economists, then you will be led to a particular conclusion about the action we ought to take to tackle climate change.

Of course, the details of that story are technical, because climate change is a technical issue. Let me share some of them with you. In brief, if you are a typical inhabitant of the EU and you accept the plausible expert findings that:

- Greenhouse gas emissions, GDP and population will continue to grow as they have been, specifically as represented in the IPCC's A1B scenario,
- the equilibrium climate sensitivity is somewhere between 1 and 7°C, with a mean value of about 3°C,
- the pure rate of time preference is somewhere between 0 and 2% per year, with a most likely value of 1% per year,
- an extra dollar is worth between about 3 and 100 times as much to a poor Indian as to a rich American, with a most likely value of 10 times,
- impacts of climate change on the economy of the EU will be between 0.2 and 0.8% of GDP for a regional temperature rise of about 3°C, with a most likely value of 0.5% of GDP, and that non-economic impacts will be similar but slightly more uncertain, and that impacts in other regions, once they reach the same GDP per capita as the EU will be between 20% and 120% as large as in the EU, with a most likely value of about 60-80% as large,

- impacts of climate change increase at something between a power of 1.5 and 3 with temperature, most likely quadratically, with a power of 2,
- adaptation will allow us to completely avoid the economic impacts for the first 1°C of warming, and reduce both economic and non-economic impacts by between 15 and 30% for higher temperature rises,
- there is no chance of the Greenland or West Antarctic ice sheets melting if the global mean temperature rise stays below between 2 and 4°C, with a most likely value of 3°C, and the chance of them melting rises by between 10 and 30% for every degree above that, with a most likely value of 20%, and that the ice sheets melting will eventually lead to the loss of between 5% and 25% of GDP, with a most likely loss of 15% of GDP, and this loss will come into effect with a characteristic lifetime of between 50 and 200 years, with a most likely value of 90 years,
- a doubling of sulphates in the atmosphere reduces radiative forcing by between 0 and 0.8 W/m<sup>2</sup>, with a most likely value of 0.4 W/m<sup>2</sup> (total radiative forcing from anthropogenic greenhouse gases being about 3 W/m<sup>2</sup> at present),
- land warms by between 20% and 60% more than ocean, with a most likely value of 40% more,
- CO<sub>2</sub> is removed from the atmosphere with a characteristic lifetime of between 50 and 100 years, most likely 70 years, apart from the 30% of emissions that stay in the atmosphere indefinitely, and
- every 1°C of global mean temperature rise increases CO<sub>2</sub> concentrations by between 4% and 15% more than the emissions themselves would suggest, most likely 10% more, because of carbon cycle feedbacks,

then you should argue that the extra impact of one more tonne of CO<sub>2</sub> is between about \$10 and \$300, with a mean value of about \$100 per tonne of CO<sub>2</sub>, and that the price charged on every tonne of CO<sub>2</sub> emissions in the EU should therefore be about \$100.

Economic theory agrees that the best way for the polluters to be charged is by putting in place a climate change tax of about \$100 on every tonne of emissions, with the revenue from the tax either returned as a direct equal payment to each household, or used to reduce other taxes such as income, sales and payroll taxes.

I described the 12 inputs above in some detail because the model itself reveals that these are the inputs that have the most influence over the result. You may have a different view about one or more of them. That's

fair enough. There is plenty of legitimate uncertainty about all of them, which I have tried to reflect in my descriptions. The story you would tell with the model might be slightly different from the one told above.

For example, if you think that greenhouse gas emissions will follow a lower, more optimal, path in the future, you would argue for a climate change tax of more like \$75 on each tonne of CO<sub>2</sub>. If you think the range for the equilibrium climate sensitivity is somewhat lower, deduced solely from the climate change we have observed from 1970 to 2009, you would argue for a climate change tax of about \$80 per tonne.

The PAGE model does not magically produce precise answers from scientific and economic inputs that are anything but precise. It certainly does not produce the unique, right answer to climate change, brooking no argument. What it does do is help you to tell a story about justifiable climate action in a way that is rigorous and consistent with your beliefs.

True, to use the PAGE model to tell your story you need to develop some passing familiarity with notions such as climate sensitivity, rates of time preference and ice sheet melting. But if you are at all interested in climate change, you should be doing that anyway. Using the model to discover the implications of your beliefs is the most powerful way I know to link that hard-won knowledge with the crucial real-world decisions about climate change that are being made right now.

## Scenarios developed from Holiday Snapshots (and the plan to test their accuracy)

David Gawith

Over the past three months I have been on a chaotic and largely improvised journey with four of my closest friends. We are all from New Zealand but for the past few years we have been living in different parts of the world. We gathered in Delhi earlier this year, and we have been travelling by land and sea towards New Zealand since then. We have been trying to visit all of the places that we would normally skip over in an airliner. The grand plan is to make it home, settle into serious work for the next 35 years, then do the same trip in reverse when we all retire. We want to retrace our steps, visit the same towns and meet with some of the same people to see how things change in the coming decades.

Inevitably, we have found ourselves imagining how certain places might change over the next 35 years, and considering the prospects of the people we have met. Perhaps without being conscious of it, we have all been developing scenarios. We imagine possible futures for people and places, coloured by our interactions, observations, and differing expectations about how the world may change. The scenarios in my mind are particularly sensitive to climate change because I have spent the last three years completing a PhD on the socio-economics of climate change adaptation. I notice when people struggle with too much or too little water, or when they blame natural disasters on religious indiscretion, and these factors inform the scenarios that I imagine. My friends have different knowledge and expertise, as do the people we have met along the way, which means that we each imagine different scenarios. We use evidence as we strive to make our scenarios plausible, but in practice they are largely built on assumptions and sometimes on pure imagination. All of our scenarios will be wrong, but discussing them can be valuable when they help us to understand trade-offs and priorities.

Something that has struck me on this trip is the extent to which the scenarios developing in my mind have come to be influenced by culture. With respect to climate change, economics and the natural sciences generally present scenarios that are determined by opportunities and challenges. Present people with more favourable climatic conditions and they will thrive; burden them with challenging conditions and they will struggle. However, the more I think about the places we have visited the less I believe that external opportunities and challenges are fundamental

to peoples' prospects. In my scenarios, prosperity is determined by whether people are equipped or prepared to *seize* opportunities or *respond* to challenges. For many people, this is determined by culture.

We have visited some communities where I can only imagine people prospering over the next 35 years, and others for which I struggle to imagine anything other than continued frustration and poverty. For example, we have spent time in areas where most of the agricultural work was done by women, yet people were surprised to see a woman capable of riding her own motorcycle. It seems unlikely to me that communities in these areas will be able to respond effectively to changes in agricultural conditions, because those best placed to guide change are disadvantaged. In some places people were also limited by their social groups, which were culturally fixed based on peoples' bloodlines. In these places some people could only ever expect to do menial labour, while others could work very little and remain relatively wealthy by controlling assets. Religion was often a powerful force in these communities, meaning that some things were not able to be questioned, and changes were screened against traditional beliefs. In my scenarios, these communities will struggle to seize opportunities for development because so much of their populations' human potential is disadvantaged or dismissed.

But we have also visited places where people are treated more equally and change is welcomed. We have seen remarkable ingenuity and social agility. In a number of remote places we have seen local tourism developments outcompeting foreign-funded ones. Some people have been able to meet changes in market demands that might have been unimaginable a generation ago. We have also seen acceptance of religious change and flexibility, while being fed well during Ramadan in predominantly Muslim areas. Some people in particular have seemed interested in how things are done elsewhere, and unafraid of change or how others in society may respond to it. In my scenarios, these people and their communities prosper regardless of the challenges they face, because they have the freedom to challenge the status quo in responses to changes around them.

I look forward to seeing how these places *actually* change on the return trip in 35 years' time. Many of the communities we have passed through will be challenged by climate change. I know that many of my assumptions will be wrong. I expect to be surprised, but I hope that most of the surprises are positive.

## Towards equitable forest governance in Nepal: Reflections on future scenarios

*Poshendra Satyal*

In this short essay, I use the idea of scenarios to reflect on the future of forest governance in Nepal, focusing on issues of equity and justice, a subject area that I have researched for the past thirteen years. While the majority of my narrative is based on evidence, it also includes my own reflections and imagined future projections about Nepal's forestry sector. My research has looked into the historical roots of forest politics and contestations in Nepal, using forest history as a 'dialogue between past and present' (Satyal, 2010); analysed forest conflict dynamics using a multilevel approach (Satyal & Humphreys, 2013; Dhungana et al., 2017); and turned an environmental justice lens on issues of the representation and participation of a variety of actors (Satyal, 2017; Satyal et al., 2018; Dawson et al., 2018). Drawing on these, I briefly reflect on the past and present trends of forest policies and practices in Nepal to contemplate possible future scenarios. In that sense, I take scenarios as a tool to draw lessons from the past, analyse the present, and plan for the future. Scenarios can also help us understand complexities and uncertainties and encourage creative ways of thinking for the future.

Before the 1990s, mirroring the socio-politics of the country as a whole, Nepal's forestry sector was an inequitable domain and a top-down bureaucracy that principally benefitted the state and ruling elites, with ordinary people not receiving a fair share of the benefits nor having a say in forest management. It was only in the 1990s that the idea of forest justice began to appear as a result of increasing awareness of political rights amid the general public. These ideas of justice, largely attached to political freedom, human rights, and global discourses of democracy, were swiftly taken up during the development of the community forestry programs by many forest user groups who became increasingly aware of their roles, rights, and responsibilities. Owing to the changes in the political processes in Nepal during that period, the forestry sector was also democratised, the top-down bureaucracies of the past replaced by multi-stakeholder processes at the national, sub-national and local levels.

From 2006 on, following a new wave of democratic activism and a move towards federal republican governance, changes to forestry policy opened the way for this sector to contribute to a larger movement of environmental and social justice in Nepal. The nation's political landscape has changed drastically over these years, which has been reflected to some

extent in changes to governance and institutional structures. Following a period of post-conflict transition (2006–2017), leading up to the creation of a new constitution and local and national elections in 2017, Nepal has seen a shift toward democratisation and decentralisation, and a more inclusive polity. This has provided institutional and political space for the inclusion of hitherto marginalized groups. Forest governance mechanisms such as community forestry have already witnessed some progress in that direction, for example, the setting of a target to make women 50% of the membership of all management structures. This has had benefits beyond forest management. For example, the empowerment of community forest members has resulted in a new generation of elected leaders in Nepal: in the 2017 local elections, around 2,000 forest user group members were elected to various positions, and many of these were women. This shows how deficits of justice and participation can be tackled through special arrangements and affirmative actions, such as provisional quotas and forest governance reform, that not only benefit the immediate sector but inspire more participation in politics.

Despite these successes, future scenarios of forest governance in Nepal are complicated by uncertainties arising from three major drivers: (1) bio-physical — including the impacts of wider environmental and climate change; (2) socio-economic and political factors; and (3) policy changes, such as the introduction of carbon forestry. First, since Nepal sits in the centre of the fragile Himalayan system, the region is a hotspot of climatic and geological instability (Satyal et al., 2017). While the Himalayas and the local communities living there have been historically resilient, forests and community-based management such as forest user groups will struggle to cope with the unprecedented scale of the coming changes. As change becomes the new normal, it is difficult to predict how forests and their management will look in the future, in terms of impacts on landscape, and on local communities and their livelihoods. Second, after years of political transition, Nepal is grappling with an agenda of economic growth and infrastructure development such as roads, railways and hydropower. This raises the questions of whether this grand developmentalist vision will be compatible with local social-cultural and environmental conditions, and whether long-term development plans and priorities will sufficiently take into account environmental changes that may occur in the future. Third, forest governance in Nepal is likely to be transformed by future policy changes that are hard to predict. These new policies will create opportunities and challenges alike. For example, with the new focus on payment for environmental services and REDD+ (Reducing Emissions from Deforestation and forest Degradation), the concept of justice has shifted to who has carbon money; who is a legitimate actor in policy process (procedural justice); and issues of recognition

(indigenous and community rights). New policies may also result in more restrictions to forest access, overlap with other land uses, and competing claims over land and forests.

The idea of justice, applied to future scenarios for Nepal's forestry sector, suggests the need to reflect on current environment and development pathways and seek policy options that respond to the likely biophysical changes and societal needs of the future. It is also important to plan strategically, rather than just respond to change — to take a forward-thinking approach, rather than crisis-driven one. Such an approach should not only aim to address the concerns and aspirations of people living there, but also improve Nepal's prospects of achieving its global development aspirations (such as Sustainable Development Goals) and climate mitigation and adaptation goals (like the Paris Climate Agreement).

## Climate Change Storyworlds: Modelling and Literary Fiction

*Johannes Stripple, Alexandra Nikoleris*

If the Earth's mean temperature increased by another three degrees, the south of Europe would experience more extreme heat more often and severe drought would not be uncommon (Kovats et al., 2014). David and his daughter Lou, displaced from their home town after its destruction by fire, live in just such a future. They are the protagonists of one of the two story strands in Maja Lunde's novel *Blue*, set in southern France in the year 2041. Having escaped the flames, David and Lou find a refugee camp by the dry river Garonne. It has not rained for five years. Necessities in the camp are scarce, the food and water provided are soon used up. But there is nowhere to go, really — the borders to the countries in the north, where there is water, are closed.

We do not get to know much more about the world in which David and Lou are living. This is a story about that which is lost in a changing world: the loss of family members, but also of a dependable supply of water, food and shelter. It is also a story about how to take care of others — even the ones that are not your closest family, even if there is a shortage of resources. The novel's message is never to let go of hope.

Can a dialogue between fictional stories and climate modelling facilitate much-needed public conversations about climate change? We tested this idea with a public talk we gave in Kristianstad, Sweden. We presented climate change scenarios for Sweden, and for Europe more broadly, in the areas of 'ecosystem change', 'sea level rise' and 'drought'. Each set of scenarios was connected to a novel which was briefly presented: Barbara Kingsolver's *Flight Behavior*, Kim Stanley Robinson's *New York 2140*, and Maja Lunde's *Blue*.

Each of these novels take us into a future where the climate is wetter or drier than the one we know; where new species appear; or where a city is fundamentally transformed by sea level rise. A novel, which generally revolves around a few characters, prompts the reader to ponder the future of a climate changed world at the intimate scale of personal experience. Bringing these relatable personal narratives into dialogue with big-picture climate scenarios can draw out the materiality, and the proximity, of a radically changed world. "It made those numbers much more real," one attendee commented. "I hadn't realised that refugees will be coming from within Europe so soon."

By bringing scenarios and literary fiction together, we and the audience started to explore, navigate and experience particular climate change storyworlds. The concept of a storyworld is usually used to capture how transmedia storytelling works across different platforms, e.g. novels, films and video games — the stories are told in different ways, but are all part of the same storyworld. We propose extending the concept of storyworld to include modelling and scenarios as specific kinds of storytelling practices. There is much potential in creating particular climate change storyworlds, in which climate science and narrative fiction tell the same story in different and mutually illuminating ways.

## How the rules of history allow us to plan to save our planet

*Simon Lewis, Mark Maslin*

For the first time in our planet's 4.5 billion-year history a single species, humans, are increasingly dictating its future. Our impacts on Earth are now so large that many scientists declare we have entered a new human-dominated geological epoch called the Anthropocene (Lewis and Maslin, 2015; Waters et al. 2016).

The scale of humans' impact on Earth is immense. Globally, human activities move more soil, rock and sediment each year than is transported by all other natural processes combined. Factories and farming remove as much nitrogen from the atmosphere as all Earth's natural processes do (Canfield et al., 2010). We have made enough concrete to cover the entire surface of the Earth in a layer two millimetres thick. We make over 300 million tonnes of plastic per year, and it is found in every ocean. Annually we produce 4.8 billion tonnes of our top five crops, plus 4.8 billion head of livestock. There are 1.2 billion motor vehicles, 2 billion personal computers, and more mobile phones than the 7.5 billion people on Earth (Lewis and Maslin, 2018).

Human actions have also increased atmospheric carbon dioxide by over 40 per cent to a level not seen for at least 2 million years, delaying the next ice age (Tzedakis et al., 2012; Ganopolski et al., 2016) and driving rapid climate change (IPCC, 2013). Anthropogenic climate change is ending the unusually stable planetary conditions over the past 10,000 years that allowed farming and complex civilizations to emerge (Maslin and Lewis, 2015).

Populations of fish, amphibians, reptiles, birds and mammals have declined by an average of 58 per cent over the last forty years. Extinctions are commonplace, running at 1,000 times the typical rate seen before humans walked the Earth (Barnosky et al., 2011). And if you weighed all the land mammals on Earth, 30% of that weight would be humans, 67% the farm animals that feed us, and just 3% would be mammals living in the wild (Smil, 2013; Bar-On et al., 2018). We live on a human-dominated planet and our impact goes way beyond the simple climate change narrative.

To understand Earth's potential futures it is essential to understand how these huge impacts came about. Lewis and Maslin (2018) redefine history by describing just five major types of human society that emerged and then spread worldwide; Hunter-gatherer, Agricultural, Mercantile

capitalist, Industrial capitalist and Consumer capitalist. Each of these successive shifts started with a major, and usually traumatic, transition: domestication, European expansion and colonization, Industrial Revolution and, following the Second World War, the Great Acceleration. Each subsequent stage relies on more energy and greater production and faster flow of information and knowledge. This led to an increase in the population, and their collective agency increased as per capita productivity rose.

Seen this way, renewable energy for all takes on an importance beyond stopping climate breakdown. Likewise, free education and access to the internet for all has a significance beyond our access to social media, as these factors contribute to women's reproductive autonomy, which could help to stabilize the human population. However, while more energy and greater information availability appear to be the necessities for any new kind of society, such increases could also increase our environmental problems, as has happened in the past. To usher in a new way of living, the contemporary trend of ever-increasing production and consumption must be broken, and the change supported by a societal focus on environmental repair. Two increasingly discussed ideas could achieve just this.

Universal Basic Income (UBI) is a policy whereby a financial payment is made to every citizen, unconditionally, without any obligation to work, at a level above their subsistence needs. Most people would still work, but UBI could break the link between paid work and consumption. We have all done it — said, 'I'm working so hard, I deserve that fancy sandwich, new gizmo, or long-haul holiday. Consumption is the payoff for being ever more productive at work. With UBI we could think long-term, well beyond the next pay cheque, as living in the Anthropocene demands — working less and consuming less. Small-scale UBI experiments show that it could support us to work, educate ourselves, and care for others and the wider environment, while meeting our needs.

Environmental repair could come from the simple but profound idea that we allocate half the Earth's surface primarily for the benefit of other species. This might be less utopian than it first appears. As we increasingly recognise that we humans are part of nature, new ideas of 'rewilding' (large areas managed to allow natural processes to run) and 'restoration' (bringing back forests) are taking hold. In practical terms, there have been recent commitments across 43 countries to restore a total 292 million hectares of degraded land to forest — ten times the area of the UK.

Universal Basic Income and Half-Earth are not the remedies for all modern society's ills. UBI needs to be combined with the provision of free essential services, such as access to clean water, healthcare and education. Progressive taxation is essential to rebalance inequalities, and this in turn reduces costs, as it has been shown that smaller social divisions within a

country lower health care costs and improve longevity. Outdated global institutions that were very successful in producing rapid growth in the second half the twentieth century need to be dismantled, and governance structures fit for the twenty-first century need to be created, to accelerate sustainable development and the redistribution of wealth between countries.

The now certain fact that human actions are driving far-reaching changes to the life-supporting infrastructure of the Earth has profound philosophical, social, economic and political implications (Chakrabarty, 2015; Latour, 2015; Barry and Maslin, 2016). It allows us to conceive new and radically different scenarios for the future, even to envisage a 'Good Anthropocene' (Dalby, 2016). It will take many interlocking initiatives to replace today's consumer capitalist mode of living with something more sustainable. But if history teaches us anything, it is that we must do something radically different — something that breaks the productivity rules that have governed all of human history — to give humans and the other species with which we share our home planet the best chance to flourish.

This essay is drawn from our book, Simon Lewis and Mark Maslin, *The Human Planet: How We Created The Anthropocene*, published by Penguin in 2018.



## Planning for an unpredictable future? The Case of Bangladesh

*Meraz Mustafa, Saleemul Huq*

A hundred years ago Bangladesh was still part of British India; sixty years ago it was part of Pakistan. Only since 1971 has the country been its own sovereign state. The population of the capital, Dhaka, has ballooned from less than half a million in 1950 to more than 16 million today. Few believed in the early 2000s that Bangladesh would successfully meet the United Nations Development Programme (UNDP)'s eight Millennium Development Goals; yet a little over a decade later the country is recognised as a shining star of development.

The point of comparing the past with the present is to suggest how unpredictable the future can be. Even with our best scientific models, the best we can ever do is provide an educated guess. When Henry Kissinger described Bangladesh as a 'basket case' in the early 1970s, could he really have predicted then that in less than 50 years the country would join the 'space race' and send a satellite of its own into Earth's orbit?

This complexity is only going to intensify as climate change continues to make its presence known — especially for a country like Bangladesh. It is situated on the delta of the Ganges river basin, with most of the country barely one meter above sea level, leading scientists to predict risks of more intense cyclones, sea-level rise, irregular rainfall, and unpredictable seasonal variation. However, what makes Bangladesh particularly vulnerable to climate change is not simply these geophysical hazards, but also the country's demographic composition. Bangladesh's population is approximately half that of the United States, crammed into a land mass roughly the same size as Iowa, and many of those people live in poverty. The consequences of climate change for such a population are potentially devastating.

Yet Bangladesh is not simply a victim to climate change; it is also a 'champion of adaptation', as many other countries and organizations have observed. Since the mid-2000s, the government of Bangladesh has dealt with the issue of climate change at the highest levels of authority. Through initiatives such as the National Adaptation Programme of Action (NAPA) in 2005, the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2009, the Nationally Determined Contribution (NDC) of 2015, and the revised version of the BCCSAP to be published this year, the government of Bangladesh has very actively worked to address climate

change through a multi-sectoral approach where even specific climate budgets were set aside for policy implementation.

But the challenge of climate change is that it is unpredictable. Even the best climate scientists, point to the complexity of the climate system: of trends that may hold for the next 50 years, but will not hold for the next hundred. This is because the climate is not a linear, straightforward system. How then do you plan for a future that is not predictable — especially when the stakes are so high, and the impact so widespread?

This is where scenario planning comes in; a process where different groups of stakeholders develop various alternative visions of the future, and then work backwards to figure out the assumptions that would lead to each future. For example, if Bangladesh plans to rely on 100% renewable energy by 2050 (as it promised during the Marrakesh climate talks in 2016), what conditions will have to change in the near future to put the country on track to meet that goal? Similarly, if the country is to become food secure by 2050 — in terms of calorie count and nutrition, and also in regards to cultural requirements — what conditions will have to emerge for this to happen?

Our organization, the International Centre for Climate Change and Development (ICCCAD), most recently engaged with the scenario building process in a project called "Zero Hunger, Zero Emissions". We were partnered by the Environmental Change Institute at Oxford University, Oxfam Great Britain, and Oxfam Bangladesh. In this project, we brought relevant stakeholders together, including experts and members of the Planning Commission, to analyze the possible implications of linking SDG 2 (zero hunger) with SDG 13 (climate change) in terms of synergies and trade-offs. Such exercises help us plan for uncertain futures; and perhaps more importantly, reflect on the assumptions present in our own planning.

Unlike other development goals, adaptation is not a destination but a process: an iterative process of learning-by-doing that encounters the unpredictability not only of climate change but of how the future unfolds. Instead of ignoring this unpredictability, which can so often be unsettling for planners, scenario building can help us be more prepared by pushing us to question our assumptions about the future. More exercises like this will be crucial for both Bangladesh and other countries in planning adaptation initiatives for the future.

## R-Urban and its three-year scenario of how to involve everyone in 'saving the planet'

*Constantin Petcou, Doina Petrescu*

One of the recent sets of data related to climate change to be released by the International Energy Agency (IEA) concerns the global cost of the maximum 2°C global warming target — in other words, the cost of putting into practice the COP21 Paris Agreement. This cost has been estimated at \$44,000 billion, to be spent between now and the year 2050, to cover environmental repair, the development and rollout of green energy technologies, and necessary changes to manufacturing methods.

As a point of comparison, this figure represents the entire EU budget over a period of 235 years. Of course, we cannot afford to wait 235 years to solve this problem, even if the EU were able to devote its whole budget to the effort — because the longer we wait, the more impossible the task will become. In any case, we know that in the current context, in which global politics is dominated by populist discourse and climate change denial, governments will struggle to devote even a fraction of their budgets to this crucial ecological transition. What can we do about this? Can we, as citizens of the world, contribute to covering some of these costs through our own engagement?

In 2008, the architectural practice, atelier d'architecture autogeree (aaa), initiated R-Urban ([r-urban.net](http://r-urban.net)), a bottom-up strategy for enhancing urban resilience by setting up networks of civic hubs for the coordination of various collective eco-practices that are rooted in everyday life. These networks function through locally closed ecological circuits that make optimal use of local resources and support the emergence of alternative models of living, producing and consuming. R-Urban provides tools, training and resources to facilitate citizen governance and direct climate action.

The strategy has been in place since 2011 in Colombes, a suburban town to the northwest of Paris, in partnership with the municipality and a number of local organisations. Public Works — an organization based in the UK — along with its network of public and civic partners have also joined the project, to enable the transnational exchange of knowledge and seed the strategy in different countries. So far, R-Urban has established five hubs in France and the UK, and is planning to open further units: two hubs in Bagneux, one in Nanterre, and one in Dakar. The R-Urban hubs are expected to further grow in number, with each one managed

by a cooperative land trust that will acquire space, facilitate development, and guarantee democratic governance of the network of urban commons. The first R-Urban hubs have achieved a very positive environmental impact: a reduction of 740 tonnes per year in CO<sub>2</sub> emissions per hub; a 60% reduction in CO<sub>2</sub> emissions for the construction of hubs compared with standard construction; 100% capture and reuse of greywater; 82% of building waste recycled; and 286 tonnes per year of rain water collected and used (Petrescu, Petcou, Baibarac, 2016).

Together with researchers from the Community Economies Collective (CEC), [communityeconomies.org](http://communityeconomies.org), we have calculated that, for an initial investment of €500,000 per hub (including the costs of building and management), the yearly return on investment (which includes the value of ecological and environmental repair embedded in the activities of the hub) is €2 million.

And here comes our (based-on-facts-but-maybe-a-bit-utopian) scenario of how the R-Urban movement can cover the global ecological transition costs in only three years through citizen involvement.

In 2016, the 300 citizens involved in R-Urban have generated €2 million (of monetary and non-monetary value) that could contribute to covering the planet's eco-transition costs. Half of this value results from actions against global warming (eco-transportation, waste recycling, water consumption reduction, short ecological circuits, increase of green surface, local food production, bio-sourced materials for construction, and so on). It follows, then, that a very reasonable time investment equating to €3,333 per person per year could be invested to mitigate global warming.

The whole global population, some 7.6 billion people, should actually be concerned with the fight against global warming. But if only half were to get involved in movements such R-Urban, and through their voluntary work produce an equivalent value of €3,333 per person per year in activities that prevent or mitigate global warming, the sum total of their efforts would be around €12,665 billion / \$14,600 per year — a third of the total cost of the ecological transition.

Paradoxically, the potential contribution of these active citizens has never been acknowledged as a valid way of generating value within this ecological transition, which otherwise seems impossible to fund. The enormous figure of \$44,000 billion which is necessary to cover these costs could be easily and quickly collected if the active population of Earth were enabled to engage their voluntary contribution over the next three years, in civic resilience and eco-commoning activities such as those generated by R-Urban.

This is a simple demonstration that yes, a successful ecological transition could be effected in only three years' time, by making voluntary

changes to our way of living. And that yes, this can be achieved if citizens work together with current governments and agencies. This is about much more than just covering the monetary costs; it is about the majority of the inhabitants of this planet becoming aware of, and responsible for, the cost to this planet of their way of life, and being able to see the positive consequences of change within their lifetime. This is the way not only R-Urban, but also a multitude of small civic projects across the world, could 'save' our planet, now!

## A Tour of the Northwest Passage

*Charlotte Connelly*

*Roll up, roll up! Join us for a special Polar Museum tour of the Northwest Passage, now open due to climate change!*

On a slushy Sunday in January 2018, visitors arrived at the Polar Museum in Cambridge not knowing quite what to expect. They were enthusiastically welcomed in from the cold and offered the chance to play the part of Arctic tourists and follow a brand new family-friendly trail around the museum.

Just 48 hours earlier, the team of six people who produced the trail had met for the first time at the Climate Hack. The Climate Hack asked a simple question of four teams, each based at one of the University of Cambridge's museums: how would you change one of our museums to tell stories about climate change? Over three days, the teams were challenged to make a prototype exhibit to share with visitors. Armed with their own skills as designers, makers and communicators, and the laser cutters, 3D printers and all the other resources the Cambridge Makerspace had to offer, the teams variously built a listening post where visitors could listen to the sounds of changing environments, designed a storytelling experience where visitors were told stories about flooding from across the world, and constructed an interactive experience where visitors explored how a Campbell-Stokes sunshine recorder has helped scientists collect climate data.

In an intensive first morning at the Climate Hack, teams were introduced to research about climate change. They investigated what gets audiences interested in narratives of change: people, politics and the long history of climate research. Newly equipped with a portfolio of audience research, the teams headed off to their individual museums.

'The warming Arctic presents both challenges and opportunities for people who live and work there.' This opening line from a researcher from the Scott Polar Research Institute, home of the Polar Museum, set the tone for the team's exhibit.

'For Inuit communities, travelling and hunting are becoming more difficult due to the thinning sea ice. On the other hand, growing tourism and trade provides a welcome cash injection to some parts of the Arctic.'

Detailed discussion, challenging questions, the production of data sets, and lots of ideas flowed from this brief introduction to how climate change is already changing life in the far north. Having learned from our Climate Hack research morning that a barrage of doom and gloom puts

museum audiences off stories about climate change altogether, the team decided to design a visitor experience that presented a range of voices, experiences and opinions about climate change to visitors. They set to work developing their trail, designing graphics and building their exhibit.

By the time visitors began their chilly journeys across Cambridge, the team had installed an interactive map of Arctic sea ice. On arrival, visitors were invited to turn a dial and watch the ice rhythmically grow and shrink as they cycled through the months of the year. By turning a second dial, visitors saw the initially small variations in Arctic sea ice from year to year, followed by dramatic reduction in recent decades revealing, among other things, the increasingly accessible Northwest Passage.

Now introduced to their route, visitors were presented with a special polar passport which they could get stamped at various checkpoints around the museum as they navigated their way through the museum's Northwest Passage trail. On their travels they encountered different characters: scientists shared their concerns for a warming planet, but also the thrill of being able to investigate newly accessible regions; tourists described the excitement of seeing rare Arctic wildlife, as well as the importance of witnessing changes in the Arctic; and Inuit villagers revealed the challenges to their way of life as the animals they rely on for food become harder to hunt, but also the benefits of sharing their history and selling traditionally made products to tourists. By stepping into character and navigating a 3D space, museum visitors were able to explore a complicated scenario about the present and future of the Arctic at their own pace.

As our visitors travelled around the museum, collecting passport stamps, trivia and a range of opinions about the changing Arctic, they had time to reflect and form their own opinions. For some visitors, the exposure to opportunities as well as challenges from the receding ice of the far north was incompatible with how they thought an authoritative and influential organisation like the Polar Museum ought to behave. However, the majority of visitors reported that having the space to understand and explore the different ways people are experiencing the warming Arctic inspired them to think differently about climate change. The Climate Hack team's intention was to help visitors understand the Arctic as a place in a network, where humans have complex relationships with their local and global environment. As the team packed up their prototype and waved the last of their visitors off into the dark and icy January winds, it was not hard to imagine many ways we are linked to the Arctic even as our shared climate shifts and changes.

## A cure for climate change

*Tamsin Edwards*

'Colorectal cancer is curable', said the surgeon with the dark, kind eyes. It was a known quantity, with a clear diagnosis from the CT scan — an obstruction blocking the flow, too many cells in the wrong place, too much of a good thing — and a clear pathway for treatment. They weren't yet sure quite how serious it would be: I would have to wait for another scan of my lungs, later, and a forensic examination of the cells they would remove the next day. But it looked like the odds were good. On Friday 12th January 2018, around 5pm, alone, my story had changed.

My work as a climate scientist is founded in probability and risk. Predicting the most likely value of sea level rise by the end of this century. Assessing the probability that the Antarctic ice sheet will disintegrate enough to embark on a path of unstoppable loss. Trying to help people understand flood risk, one-in-100 events, the time periods in which the danger might return. How can we expect the public to trust our work if we talk in terms of "likely ranges", "uncertainties" and "unknowns"? How can we ask anyone to trade one uncertain risk — climate change — for another, certain one: change to a way of life?

Now I see probabilities in clear, solid light. My oncologist tells me my prognosis before I begin to take the toxic drugs. I search journal articles, conference slides and blog posts for meaning, detail, concrete conclusions. Trying to find one extra percentage point of safety and certainty, another, one more. Maybe the odds are better because I'm younger? Because it's one lymph node, not two or three? What level of risk would feel tolerably safe, and what level would be terrifying? I read and misread statistics, am panicked and then reassured, cry one day and then the next am exhilarated by cheating death — most people do not have such a conveniently obstructive tumour, one that makes them sick enough to see a doctor before it is too late.

I weigh one uncertain risk — metastasis — against another, certain one: peripheral neuropathy. My particular soup of chemicals is FOLFOX: not a handsome auburn face but an infusion from a pump that beeps for attention, followed by a milk bottle-sized container of cytotoxic clear liquid attached to an implant in my chest for two nights and two days. I am told that OX stands for a drug that will almost certainly damage the nerves in my fingers and toes, possibly forever — more likely with each dose, more unwanted side-effects with each action. I begin the regime thinking I will take all 12 hits of OX, that I will take any peripheral pins and needles, any neuro-related numbness, in exchange for a 1% or 0.1%

chance at growing old. After nine cycles, I am in tears at the clinic, and the kind professor stops the dose. It continues to worsen, still. In shoes, my feet are encased in wet sand. Stretching my arm means electric bolts travel down my hands and forearms: like a superhero wrongly wired up. Water from the tap makes me wince, and the towel afterwards feels like rough rock. I ask people to help me rummage at the bottom of bags, tie shoelaces, open bottles that have tight, rough lids. I wear gloves to sleep and to type, and wonder if I should have stopped one cycle earlier. If it was worth it, my deal with the devil to be saved. I know climate policies are designed to make life better, not worse, but I gain a better understanding of people's fear. One risk for another. Knowns for unknowns. In the Brothers' Grimm story 'The Grave Mound', the devil is called the 'charcoal-burner'.

Greenhouse gases are obstructing the flow of heat from the earth. Allowing less and less radiation through, like the ever-closing circle of my tumour. But without them there would be no life on earth. Like the warmth of a campfire, greenhouse gases sustain us in the cold night of the universe. The concern today is one of balance: too much of a good thing.

These probabilities of cancer and climate change circle my head at night like mosquitoes. If we make the strongest reductions of greenhouse gas concentrations that we can imagine, we have only a two in three chance of fulfilling the Paris Agreement. And the only way we can think of doing this is to turn over great tracts of cropland to fuel.

Now, an old hand, I recklessly trade risks. I sign up to a clinical trial, taking aspirin to try and increase the return period of the danger. To reduce the probability of unstoppable loss. There is a two in three chance I will get the aspirin, but otherwise, a placebo. I could just buy the aspirin for myself. Or put my head in the sand. Instead I choose to throw the dice: for science, and for others that follow after me.

# Contributors Bibliography

# Contributors

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**Robert Butler** is a writer, specialising in two subjects – the arts and the environment. He has been the drama critic of the *Independent on Sunday*, the online editor of the Economist's *Intelligent Life* magazine, the 'Going Green' columnist for *Intelligent Life* and co-editor of the Ashden Directory of Environment and Performance. His book publications include *The Art of Darkness* (Oberon) and *The Alchemist Exposed* (Oberon). He is currently a Doctoral candidate at the Open University. He is co-initiator of the Culture and Climate Change publication series with Renata Tyszczyk and Joe Smith and co-edited *Recordings, Narratives and Scenarios*.

**Nigel Clark** is Professor of Social Sustainability at the Lancaster Environment Centre, Lancaster University. He is the author of *Inhuman Nature: Sociable Life on a Dynamic Planet* (2011) and co-editor of *Atlas* (2012), *Material Geographies* (2008) and *Extending Hospitality* (2009). He is currently editing (with Kathryn Yusoff) a special issue of *Theory, Culture & Society* on 'Geosocial Formations and the Anthropocene' and working on a book (with Bron Szerszynski) entitled *Anthropocene and Society*.

**Charlotte Connelly** is the Curator of the Polar Museum at the Scott Polar Research

Institute (University of Cambridge). She is a historian of science and technology and has specialised in working with different audiences to co-curate museum displays. Since joining the Polar Museum in 2015, Charlotte has worked with volunteers and students to produce an exhibition about Antarctic science in the 1950s, which led to the Antarctic treaty which continues to preserve Antarctica for peace and science today; and led the Climate Hack project which saw teams of makers build prototype exhibits in four Cambridge museums over the course of a weekend.

**Emma Critchley** is an artist who has worked underwater for over a decade using photography, film, sound and installation. Her work has been exhibited extensively both nationally and internationally and awards include the RCA's 'Sustain: Moving Minds', winner of the British Underwater Image Festival and finalist in the Saatchi Gallery's *New Sensations 2011* and *UK/RAINE 2015*. In 2016–2017 she was one of the artists on the Climate Change in Residence programme of Culture and Climate Change.

**Lena Dobrowolska** is part of an artist collaboration with Teo Ormond Skeaping. They work with a combination of documentary photography, documentary film, installation, interactive documentary and research in order to produce multifaceted projects that are intended to reflect the complexities of today's world. Since 2012 they have been working on projects relating to Climate Change and the Anthropocene. Their work has been exhibited internationally including exhibitions at Łódź Fotofestival (2018), Krakow Photomonth (2016), Fotofestiwal (2014), Fotograf festival (2014), Mpm Gallery (2015) and The Grey House Foundation (2016). In 2016–2017 they participated in the Climate Change in Residence programme of Culture and Climate Change.

**Tamsin Edwards** is a climate scientist, specialising in testing and assessing uncertainties for climate models, especially for the Antarctic and Greenland ice sheet contributions to future sea level rise. She is a lecturer in Geography at King's College London. She is a science communicator and writes a popular science blog hosted by the Public Library of Science (PLOS), and has acted as a scientific consultant for the BBC.

**David Gawith** recently completed his PhD in Land Economy at the University of Cambridge which focused on understanding the behavioural barriers to climate change adaptation in agriculture. He has a background in physical geography and development studies. He has been involved in a number of projects assessing the economic impacts of natural disasters, and various approaches to climate change adaptation. Before travelling, David worked in the OECD's Environment Directorate on a project assessing policy coherence in the land use sector.

**Chris Hope** is Reader in Policy Modelling at Judge Business School. He was a Lead Author and Review Editor for the Third and Fourth Assessment Reports of the Intergovernmental Panel on Climate Change, and an advisor on the PAGE model to the Stern review on the Economics of Climate Change. In 2007, he was awarded the Faculty Lifetime Achievement Award from the European Academy of Business in Society and the Aspen Institute.

**Mike Hulme** is Professor of Human Geography at the University of Cambridge. His work sits at the intersection of climate, history, geography and culture and is concerned with how knowledge about climate and its changes is made and how the idea of climate change is represented in public discourse. His latest book *Weathered: Cultures of Climate* was published by SAGE in November 2016.

**Saleemul Huq** is the Director of the International Centre for Climate Change and Development (ICCCAD) at Independent University, Bangladesh (IUB) and Senior Fellow at the International Institute

for Environment and Development (IIED) in London and past Director of the Climate Change Programme at the institute. He has worked extensively in the inter-linkages between climate change (both mitigation as well as adaptation) and sustainable development, from the perspective of the developing countries, with special emphasis on least developed countries (LDCs). He has published numerous articles in scientific and popular journals, was a lead author of the chapter on Adaptation and Sustainable Development in the third assessment report of the Intergovernmental Panel on Climate Change (IPCC), and was one of the coordinating lead authors of 'Inter-relationships between adaptation and mitigation' in the IPCC's Fourth Assessment Report (2007).

**Alex Kirby**, a former radio, TV and online BBC News environment correspondent, is a founder editor of the Climate News Network. He was named environment journalist of the year at the UK Regional Press Awards 2017 for his reports for the weekly Cambridge Independent.

**Simon Lewis** is Professor of Global Change Science at University College London and the University of Leeds. His research focuses on how humans are changing Earth as a system, with a focus on the tropics. A plant ecologist by training, he gained his PhD in Amazon rainforest ecology from Cambridge University, and was a Royal Society Research Fellow for 10 years. His recent scientific findings include discovering the world's largest tropical peatland – as large as England – in central Congo. He advises several African governments on forest and climate science and related policy. With Mark Maslin he is author of *The Human Planet: How We Created the Anthropocene* (Penguin books/Yale University Press).

**Mark Maslin** FRGS, FRSA is a Professor of climatology and environmental sciences at University College London. He is the Director of the London NERC DTP and is a Royal Society Industrial Fellow working with Rezatec Ltd a company he co-founded. Maslin is a

leading scientist with particular expertise in global and regional climatic change and has published over 160 papers in journals such as *Science*, *Nature*, *The Lancet* and *Nature Climate Change*. His books include *Climate Change: A Very Short Introduction* (OUP, 2014), *The Cradle of Humanity* (OUP, 2017) and *The Human Planet* co-authored with Simon Lewis (Penguin, 2018). He was included in *Who's Who* for the first time in 2009 and was granted a five-year Royal Society Wolfson Research Merit Award in 2011 for his work in East Africa.

**Meraz Mostafa** has a background in Human Geography and is currently completing a postgraduate degree in the Department of Anthropology and Sociology at the School of Oriental and African Studies (SOAS). He previously worked at the International Centre for Climate Change and Development (ICCCAD) in Dhaka, Bangladesh for three years.

**Alexandra Nikoleris** is a postdoctoral fellow at the division of Environmental and Energy System Studies at Lund University. Her research concerns the intersection between society, culture, and technology with a focus on how socio-technical futures are envisioned and used. In June 2018 she defended her thesis on the role of envisioned futures in sustainability transitions.

**Teo Ormond-Skeaping** is part of an artist collaboration with Lena Dobrowolska. They work with a combination of documentary photography, documentary film, installation, interactive documentary and research in order to produce multifaceted projects that are intended to reflect the complexities of today's world. Since 2012 they have been working on projects relating to Climate Change and the Anthropocene. Their work has been exhibited internationally including exhibitions at Łódź Fotofestival (2018), Krakow Photomonth (2016), Fotofestival (2014), Fotograf festival (2014), Mpm Gallery (2015) and The Grey House Foundation (2016). In 2016–2017 they participated in the Climate Change in Residence programme of Culture and Climate Change.

**Constantin Petcou** is the co-founder with Doina Petrescu of the atelier d'architecture autogérée (aaa), a professional organisation which conducts actions and research on participatory urbanism and architecture (urbantactics.org). aaa's projects include *Ecobox*, and *Passage 56*, and more recently *R-Urban* (r-urban-net) a participative strategy of urban resilience in Paris and London and *Wiki Village Factory*, a cluster for social and ecological innovation in Paris. aaa's work has received numerous international prizes including BUILDING 4Humanity Design Competition, Innovation in Politics Awards, 100 Projects for the Climate, Zumtobel, Curry Stone and the European Public Space Prize.

**Doina Petrescu** is co-founder with Constantin Petcou of the Paris based atelier d'architecture autogérée (aaa) and Professor of Architecture and Design Activism, at the University of Sheffield School of Architecture. Doina is an activist, architect and educator dealing with commons-based resilience, feminist approaches and participative architecture in her research and practice.

**Poshendra Satyal** was born and raised in the foothills of Nepal Himalayas, and is now based in the UK. He is a Senior Researcher at the School of International Development of the University of East Anglia (UK), an Adjunct Professor of the Agriculture and Forestry University (Nepal) and an Affiliate Fellow of the Tyndall Centre for Climate Change Research (UK). With a background in the natural and social sciences, he is engaged in interdisciplinary and policy relevant research on environment and development issues, particularly on environmental governance, forest management and climate change in Asia and Africa.

**Bradon Smith** is a Senior Research Associate at the University of Bristol with research interests in the Environmental and Energy Humanities, particularly the representation of climate change and energy generation and consumption in contemporary literature and culture. He was a Research Associate at the Open University on the project

*Stories of Change: Exploring energy and community in the past, present and future* (2014–2017), and at the University of Bath on *Building capacity for energy resilience in deprived areas*. He is co-editor of a special issue of the journal *Resilience* entitled *Stories of Energy* (2018) and is working on a monograph, *The Energy of Imagined Futures*.

**Joe Smith** is Director of the Royal Geographical Society (with IBG). He was, until April 2018, Professor of Environment and Society and Head of the Department of Geography at The Open University. His research interests lie in the history of environmental politics, public engagement and the media, and the politics of consumption. His research practice has a strongly collaborative and interdisciplinary quality and an experimental edge. Joe has designed and facilitated numerous seminars for environment specialists and senior media decision-makers since the mid-1990s, and advised on over 30 hours of BBC broadcasting. He led the AHRC funded *Earth in Vision* and *Stories of Change* projects. Joe was co-convenor of Culture and Climate Change until 2018.

**Johannes Stripple** is Associate Professor at the Department of Political Science Lund University. Johannes' research is concerned with the politics of climate change and its governance through a range of sites, from the insurance industry to carbon markets; from the UN to the urban and the everyday. Recent books: *Governing the Climate: New Approaches to Rationality, Politics and Power* (CUP, 2014, with H Bulkeley) and *Towards a Cultural Politics of Climate Change: Devices, Desires and Dissent* (CUP, 2016, with H Bulkeley and M Paterson).

**Zoë Svendsen** is a theatre-maker, dramaturg and researcher. As Director of METIS [www.metisarts.co.uk](http://www.metisarts.co.uk), Zoë creates research-led interdisciplinary performance projects exploring contemporary political subjects, including: *World Factory* (New Wolsey Theatre/ Young Vic), *3rd Ring Out* (TippingPoint Commission Award). As dramaturg Zoë collaborates creatively

on innovative productions of classic texts, including: *A Midsummer Night's Dream*, *Measure for Measure* and *The Changeling* (Young Vic). Zoë is an artistic associate of the New Wolsey Theatre, Ipswich, an honorary (artistic) research fellow at Birkbeck's Centre for Contemporary Theatre; and in 2014–15 was artist-in-residence at the Max Planck Institute for the History of Science, Berlin. In 2016–2017 she was one of the artists on the Climate Change in Residence programme of Culture and Climate Change.

**Renata Tyszczyk** is Professor of Architectural Humanities at the University of Sheffield. She is an academic and artist whose work explores questions concerning global environmental change and provisionality in architectural thinking and practice. In 2013 she was awarded a British Academy Mid-Career Fellowship for her research in this area. Her most recent book is *Provisional Cities: Cautionary Tales for the Anthropocene* (Routledge, 2017). For her current project on *Collective Scenarios* she has been awarded a Leverhulme Trust Major Research Fellowship (2019–2022). She convenes Culture and Climate Change. Among its initiatives is the publication series, working with producers and editors including: Joe Smith, Robert Butler, Vicky Long, Eleanor Margolies and Hannah Bird.

**Tony White** is a writer. His latest novel is *The Fountain in the Forest* (Faber, 2018). He is the author of five previous novels including *Foxy-T* and *Shackleton's Man Goes South* – the first novel ever published by the Science Museum – as well as numerous short stories published in journals, exhibition catalogues, and anthologies. White was creative entrepreneur in residence in the French Department at King's College London, and has been writer in residence at London's Science Museum, and Leverhulme Trust writer in residence at the UCL School of Slavonic and East European Studies. In 1994 Tony White founded the artists' book project Piece of Paper Press, and from 2010–18 he chaired the board of London arts radio station Resonance 104.4fm.

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