

Deep Adaptation: A Map for Navigating Climate Tragedy

IFLAS Occasional Paper 2

www.iflas.info

Professor Jem Bendell BA (Hons) PhD

Originally Published July 27th 2018.

Revised 2nd Edition Released July 27th 2020.

Author's note on this updated version:

Two years after its first release, this paper has influenced hundreds of thousands of people to reconsider their lives and work in the face of dangerous climate change. A new agenda, community and movement for Deep Adaptation to our predicament has been borne. It is comprised of people who believe that a climate-influenced collapse of societies in most parts of the world in the coming decades is either likely, inevitable or already unfolding. They are organising a diversity of activities to help reduce harm, save what we can, and create possibilities for the future while experiencing meaning and joy in the process. This movement has grown through word-of-mouth, as I did not actively seek to promote Deep Adaptation through the mass media, and instead focused on enabling peer-to-peer support.

Outside of management studies, there is a wide field of scholarship on the experience and possibility of societal collapse, which I did not know about when we released this paper from the Institute in July 2018. In addition, over the last two years many scientists have concluded that societal collapse is the most likely scenario. However, this paper appears to have an iconic status amongst some people who criticise others for anticipating societal collapse. Therefore, two years on from initial publication, I am releasing this update.

The update involves a light edit, not seeking to incorporate the range of scholarship that is relevant to societal collapse over the past two years. Instead, I focus on making specific clarifications and corrections to the original text. The paper therefore remains focused on its originally intended audience – people in the corporate sustainability field. Therefore, the paper does not address the many important issues of poverty, rights, humanitarian action, public policy, re-localisation, monetary policy, anti-patriarchy, racial justice and decolonisation. Those subjects were important to me before this paper and remain so, with various contributions on those topics at www.jembendell.com

As I am not a climate scientist or Earth systems scientist and wish to focus on other activities, if you have a view on any aspect of this paper then I invite you to engage each other by commenting on a [google document version here](#).

Occasional Papers

Occasional Papers are released by the Institute of Leadership and Sustainability (IFLAS) at the University of Cumbria in the UK to promote discussion amongst scholars and practitioners on themes that matter to our staff and students. Typically, an Occasional Paper is released prior to submission to an academic journal, as a method for receiving feedback. For instance, the first Occasional Paper, by Professor Jem Bendell and Professor Richard Little, was subsequently published in the Journal of Corporate Citizenship. However, this paper was rejected for publication by reviewers of Sustainability Accounting, Management and Policy Journal (SAMPJ), as reviewers made requests for major changes which were considered by the author as either impossible or inappropriate to undertake. Impossible, as the request to build off existing scholarship on this topic would require there to be publications on the implications of ecologically-induced societal collapse, globally, upon which to build. A literature review indicated that there is not such scholarship in management studies. Inappropriate, as a reviewer's request not to dishearten readers by sharing my opinion we face "inevitable near-term societal collapse" reflects a form of censure found amongst people working on sustainable business and discussed in the paper. The letter from the author to the Editor of the Journal, with some feedback for the anonymous reviewers, is appended at the end of this Occasional Paper.

Acknowledgments from the Author

To write this paper, I had to block out time to review climate science for the first time since I was at Cambridge University in 1994 and to analyse implications in a rigorous way. I would probably not have done that without the encouragement of the following people for me to prioritise the issue: Chris Erskine, Dougal Hine, Jonathan Gosling, Camm Webb and Katie Carr. I thank Dorian Cave for research assistance and Zori Tomova for helping me to prioritise my truth. I also thank Professor Carol Adams for finding reviewers for this paper, and the two anonymous reviewers who provided some useable feedback despite requiring such major revisions that conflicted with the aim of the paper. I also thank Carol for involving me in the SAMPJ as a Guest Editor in the past. Some funding for my focus on deep adaptation during my sabbatical was provided by Seedbed. Since this paper came out in 2018 and went viral, being downloaded over half a million times in the following year, I have met so many people who I am grateful to for helping to hold us all in this difficult awareness (you know who you are). I would also like to thank all the volunteers who have translated the first version of this paper into many languages. If you edit an open access peer-reviewed academic journal and would like this paper to be submitted, please contact the author.

If you wish to see the changes made, for instance, to update a translated version, you can download a [word doc showing tracked changes](#).

Abstract

The purpose of this conceptual paper is to provide readers with an opportunity to reassess their work and life in the face of what I believe to be an inevitable near-term societal collapse due to climate change.

The approach of the paper is to analyse recent studies on climate change and its implications for our ecosystems, economies and societies, as provided by academic journals and publications direct from research institutes.

That synthesis leads to my conclusion there will be a near-term collapse in society with serious ramifications for the lives of readers. The paper does not prove the inevitability of such collapse, which would involve further discussion of social, economic, political and cultural factors, but it proves that such a topic is of urgent importance. The paper reviews some of the reasons why collapse-denial may exist, in particular, in the professions of sustainability research and practice, therefore leading to these arguments having been absent from these fields until now.

The paper offers a new meta-framing of the implications for research, organisational practice, personal development and public policy, called the Deep Adaptation Agenda. Its key aspects of resilience, relinquishment, restoration and reconciliation are explained. This agenda does not seek to build on existing scholarship on “climate adaptation” as it is premised on the view that societal collapse is now likely, inevitable or already unfolding.

The author believes this is one of the first papers in the sustainability management field to conclude that climate-induced near-term societal collapse should now be a central concern for everyone, and therefore to invite scholars to explore the implications.

Reader Support

A list of readings, podcasts, videos and networks to support us in our emotional responses to the information contained in this paper is available at www.jembendell.com and at www.deepadaptation.info

Introduction

Can professionals in sustainability management, policy and research – myself included - continue to work with the assumption or hope that we can slow down climate change, or respond to it sufficiently to sustain our civilisation? As disturbing information on climate change passed across my screen, this was the question I could no longer ignore, and therefore decided to take a couple of months to analyse the latest climate science. As I began to conclude that we can no longer work with that assumption or hope, I asked a second question. Have professionals in the sustainability field discussed the possibility that it is too late to avert an environmental catastrophe and the implications for their work? A quick literature review revealed that my fellow professionals have not been publishing work that explores, or starts from, that perspective. That led to a third question, on why sustainability professionals are not exploring this fundamentally important issue to our whole field as well

as our personal lives. To explore that, I drew on psychological analyses, conversations with colleagues, reviews of debates amongst environmentalists in social media and self-reflection on my own reticence. Concluding that there is a need to promote discussion about the implications of a societal collapse triggered by an environmental catastrophe, I asked my fourth question on what are the ways that people are talking about collapse on social media. I identified a variety of conceptualisations and from that asked myself what could provide a map for people to navigate this extremely difficult issue. For that, I drew on a range of reading and experiences over my 25 years in the sustainability field to outline an agenda for what I have termed “deep adaptation” to climate change.

The result of these five questions is an article that does not contribute to one specific set of literature or practice in the broad field of sustainability management and policy. Rather, it questions the basis for all the work in this field. It does not seek to add to the existing research, policy and practice on climate adaptation, as I found that to be framed by the view that we can manage the impacts of a changing climate on our physical, economic, social, political and psychological situations. Instead, this article may contribute to future work on sustainable management and policy as much by subtraction as by addition. By that I mean the implication is for you to take a time to step back, to consider "what if" the analysis in these pages is true, to allow yourself to grieve, and to overcome enough of the typical fears we all have, to find meaning in new ways of being and acting. That may be in the fields of academia or management - or could be in some other field that this realisation leads you to.

First, I briefly explain the paucity of research in management studies that considers or starts from societal collapse due to environmental catastrophe and give acknowledgement to the existing work in this field that many readers may consider relevant. I am new to the topic of societal collapse and wish to define it as an uneven ending of our normal modes of sustenance, shelter, security, pleasure, identity and meaning. Second, I summarise what I consider to be the most important climate science of the last few years and how it is leading more people to conclude that we face disruptive changes in the near-term. Third, I explain how that perspective is marginalised within the professional environmental sector – and so invite you to consider the value of leaving mainstream views behind. Fourth, I outline the ways that people on relevant social networks are framing our situation as one of facing collapse, catastrophe or extinction and how these views trigger different emotions and ideas. Fifth, I outline a “Deep Adaptation Agenda” to help guide discussions on what we might do once we recognise climate change is an unfolding tragedy. Finally, I make some suggestions for how this agenda could influence our future research and teaching in the sustainability field.

As researchers and reflective practitioners, we have an opportunity and obligation to not just do what is expected by our employers and the norms of our profession, but also to reflect on the relevance of our work within wider society. I am aware that some people consider statements from academics that we now face inevitable near-term societal collapse to be irresponsible due to the potential impact that may have on the motivation or mental health of people reading such statements. My research and engagement in dialogue on this topic, some of which I will outline in this paper, leads me to conclude the exact opposite. It is a responsible act to communicate this analysis now and invite people to support each other, myself included, in exploring the implications, including the psychological and spiritual implications.

Locating this Study within Academia

When discussing negative outlooks on climate change and its implications for human society, the response is often to seek insight through placing this information in context. That context is often assumed to be found in balancing it with other information. As the information on our climate predicament is so negative, the balance is often found in highlighting more positive information about progress on the sustainability agenda. This process of seeking to “balance out” is a habit of the informed and reasoning mind. Yet that does not make it a logical means of deliberation if positive information being shared does not relate to the situation being described by the negative information. For instance, discussing progress in the health and safety policies of the White Star Line with the captain of the Titanic as it sank into the icy waters of the North Atlantic would not be a sensible use of time. Yet given that this balancing is often the way people respond to discussion of the scale and speed of our climate tragedy, let us first recognise the positive news from the broader sustainability agenda.

Certainly, there has been some progress on environmental issues in past decades, from reducing pollution, to habitat preservation, to waste management. Much valiant effort has been made to reduce carbon emissions over the last twenty years, one part of climate action officially termed “mitigation” (Aaron-Morrison et al. 2017). There have been many steps forward on climate and carbon management – from awareness, to policies, to innovations (Flannery, 2015). Larger and quicker steps must be taken. That is helped by the agreement reached in December 2015 at the COP21 intergovernmental climate summit and now that there is significant Chinese engagement on the issue. To support the maintenance and scaling of these efforts is essential. In addition, increasing action is occurring on adaptation to climate change, such as flood defences, planning laws and irrigation systems (Singh et al, 2016). Whereas we can praise these efforts, their existence does not matter to an analysis of our overall predicament with climate change.

Rather than building from existing theories on sustainable business, this paper is focusing on a phenomenon. That phenomenon is not climate change per se, but the state of climate change in 2018, which I will argue from a secondary review of research now indicates near term societal collapse. The gap in the literature that this paper may begin to address is the lack of discussion within management studies and practice of the end of the idea that we can either solve or cope with climate change. In the Sustainability Accounting Management and Policy Journal (SAMPJ), which this paper was originally submitted to, there has been no discussion of this topic before, apart from my own co-authored paper (Bendell, et al, 2017). Three papers mention climate adaptation in passing, with just one focusing on it by considering how to improve irrigated agriculture (de Sousa Fragoso et al, 2018).¹

Organisation and Environment is a leading journal for discussion of the implications of climate for organisations and vice versa, where since the 1980s both philosophical and theoretical positions on environment are discussed as well as organisational or management implications.

¹ A full text search of the journal database shows that the following terms have never been included in articles in this journal: environmental collapse, economic collapse, social collapse, societal collapse, environmental catastrophe, human extinction. Catastrophe is mentioned in 3 papers, with two about Bangladesh factory fires and the other being Bendell et al (2017).

However, the journal has not published any research papers exploring theories and implications of societal collapse due to environmental catastrophe.² Three articles mention climate adaptation. Two of those have adaptation as a context, but explore other issues as their main focus, specifically social learning (Orsato, et al 2018) and network learning (Temby et al, 2016). Only one paper in that journal looks at climate adaptation as its main focus and the implications for organisation. While a helpful summary of how difficult the implications are for management, the paper does not explore the implications of a widespread societal collapse (Clément and Rivera, 2016).

Away from management studies, the field of climate adaptation is wide (Lesnikowski, et al 2015). To illustrate, a search on Google Scholar returns over 40,000 hits for the term “climate adaptation.” In answering the questions I set for myself in this paper, I will not be reviewing that existing field and scholarship. One might ask “why not”? The answer is that the field of climate adaptation is oriented around ways to maintain our current societies as they face manageable climactic perturbations (ibid). The concept of "deep adaptation" resonates with that agenda where we accept that we will need to change, but breaks with it by taking as its starting point the inevitability of societal collapse (as I will explain below).

In addition, after the release of this paper in 2018, I became aware of the fields of scholarship on catastrophic risks, existential risks, and ‘collapsology’ (Servigne and Stevens, 2020). I recommend readers explore the literature in those fields, as I am continuing to do so. This paper does not incorporate insights from those fields.

Our Non-Linear World

This paper is not the venue for a detailed examination of all the latest climate science. However, I reviewed the scientific literature from the past few years and where there was still large uncertainty then sought the latest data from research institutes. In this section I summarise the findings to establish the premise that it is time we consider the implications of it being too late to avert a global environmental catastrophe in the lifetimes of people alive today.

The simple evidence of global ambient temperature rise is undisputable. Seventeen of the 18 warmest years in the 136-year record all have occurred since 2001, and global temperatures have increased by 0.9°C since 1880 (NASA/GISS, 2018). The most surprising warming is in the Arctic, where the 2016 land surface temperature was 2.0°C above the 1981-2010 average, breaking the previous records of 2007, 2011, and 2015 by 0.8°C, representing a 3.5°C increase since the record began in 1900 (Aaron-Morrison et al, 2017).

This data is fairly easy to collate and not widely challenged, so swiftly finds its way into academic publications. However, to obtain a sense of the implications of this warming on environment and society, one needs real-time data on the current situation and the trends

² A full text search of the journal database shows that the terms environmental collapse, social collapse and societal collapse have been mentioned in one different article each. Economic collapse has been mentioned in three articles. Human extinction is mentioned in two articles. Environmental catastrophe is mentioned in twelve articles. A reading of these articles showed that they were not exploring collapse.

that it may infer. Climate change and its associated impacts have, as we will see, been significant in the last few years. Therefore, to appreciate the situation we need to look directly to the research institutes, researchers and their websites, for the most recent information. That means using, but not relying solely on, academic journal articles and the slowly produced reports of the Intergovernmental Panel on Climate Change (IPCC). This international institution has done useful work but has a track record of significantly underestimating the pace of change, which has been more accurately predicted over past decades by eminent climate scientists (Spratt and Dunlop, 2018; Herrando-Pérez, et al, 2019). Some researchers have concluded that climate change is and will happen much faster than the IPCC predicted (Xu et al, 2018). For instance, the IPCC previously assigned a probability of 17% for crossing the 1.5 °C global ambient warming mark by 2030, which underestimated a few key factors, which “bring forward the estimated date of 1.5 °C of warming to around 2030, with the 2 °C boundary reached by 2045” (Xu, et al. 2018). The natural fluctuations in the Pacific “raises the odds of blasting through 1.5 °C by 2025 to at least 10%” they wrote. A closer study of this “Interdecadal Pacific Oscillation (IPO)” found that if it shifts to a positive warming phase, that “would lead to a projected exceedance of the [1.5C warming] target centred around 2026” (Henley and King, 2017). Which is statistical language for how it could even be sooner than that (but hopefully later).

Therefore, in this review, I will draw upon a range of sources outside of the IPCC, with a focus on data since 2014. That is because, unfortunately, data collected since then is often consistent with non-linear changes to our environment. Non-linear changes are of central importance to understanding climate change, as they suggest both that impacts will be far more rapid and severe than predictions based on linear projections and that the changes no longer correlate with the rate of anthropogenic carbon emissions. While non-linear change does not necessarily mean exponential, or that there might not be a curb or pause, in the natural world, changes like non-linear rise in sea level or non-linear changes in sea ice are the result of such massive processes with amplifying feedbacks, that it is reasonable to consider that such non-linear processes will be unstoppable. In other words, such changes would constitute both aspects and indicators of what is called ‘runaway climate change.’

What do people mean by ‘runaway’ change? Scientists who study climate tipping points have found that “we might already have crossed the threshold for a cascade of inter-related tipping points,” that would begin taking the Earth to a far hotter state. The researchers concluded that of the 15 potential tipping points they identified in 2008, seven now show signs of being active, meaning they may have already tipped into self-reinforcing and irreversible change. That is along with two new ones they have added to their list (Lenton, et al, 2019). With nine tipping points in total already active and inter-relating, ‘runaway’ change is a reasonable term to use for that situation. New models are projecting that on current emissions pathways we are headed for over 6 degrees of warming by the end of the century (Johnson, 2019). Therefore, if people assess that we might be, probably are, or definitely are, at the start of runaway climate change they would be credible not extreme assessments.

The warming of the Arctic reached wider public awareness as it has begun destabilizing winds in the higher atmosphere, specifically the jet stream and the northern polar vortex, leading to extreme movements of warmer air north in to the Arctic and cold air to the south. At one point in early 2018, temperature recordings from the Arctic were 20 degrees Celsius above the

average for that date (Watts, 2018). The warming Arctic has led to dramatic loss in sea ice, the average September extent of which has been decreasing at a rate of 13.2% per decade since 1980, so that over two thirds of the ice cover has gone (NSIDC/NASA, 2018). This data is made more concerning by changes in sea ice volume, which is an indicator of resilience of the ice sheet to future warming and storms. It was at the lowest it has ever been in 2017, continuing a consistent downward trend (Kahn, 2017).

Given a reduction in the reflection of the Sun's rays from the surface of white ice, an ice-free Arctic is predicted to increase warming globally by a substantial degree. Writing in 2014, scientists calculated this change is already equivalent to 25% of the direct forcing of temperature increase from CO₂ during the past 30 years (Pistone et al, 2014). That means we could remove a quarter of the cumulative CO₂ emissions of the last three decades and it would already be outweighed by the loss of the reflective power of annual Arctic sea ice cover. One of the most eminent climate scientists in the world, Peter Wadhams, believes an ice-free Arctic will occur for a summer in the next few years. Once that happens, the warming feedbacks make it near certain that, after some years, an entire year will be ice free in the Arctic, which he calculated will likely increase by 50% the warming caused by the CO₂ produced by human activity (Wadhams, 2016).³ Whereas some scientists assess warming implications to be lower than that (Hudson, 2011), if correct, it would render the calculations of the IPCC redundant, along with the targets and proposals of the UNFCCC. Between 2002 and 2016, Greenland shed approximately 280 gigatons of ice per year, and the island's lower-elevation and coastal areas experienced up to 13.1 feet (4 meters) of ice mass loss (expressed in equivalent-water-height) over a 14-year period (NASA, 2018). Along with other melting of land ice, and the thermal expansion of water, this has contributed to a global mean sea level rise of about 3.2 mm/year, representing a total increase of over 80 mm, since 1993 (JPL/PO.DAAC, 2018). The IPCC has been found to have underpredicted sea level rise, as part of its general "understatement of existential climate risk" (Spratt and Dunlop, 2018). Recent data shows that the upward trend is non-linear (Malmquist, 2018). That means sea level is rising due to non-linear increases in the melting of land-based ice.

The observed phenomena are both at the higher ranges and more extreme than what most climate models over the past decades were predicting for our current time. They are more extreme because the models did not predict the extent of the variability of weather, which is arising from phenomena such as the extent of changes to the jet streams (Kornhuber, et al 2019). The global average temperatures are at the higher edge of model predictions for the current time, especially if we consider the most recent years as indicating a new normal, rather than waiting for scientific convention to confirm decadal trends. "The average temperature for the twelve months to June 2020 is close to 1.3°C above the level [of pre-industrial temperatures used by the IPCC] for its 1.5°C and 2°C degree thresholds" (Copernicus Programme, 2020). These current measurements are consistent with non-linear changes in our environment that would then trigger uncontrollable impacts on human habitat and agriculture, with subsequent complex impacts on social, economic and political systems. I will return to the implications of these trends after listing some more of the impacts that are already being reported as occurring today.

³ This was corrected from "double" in an earlier version.

Already we see impacts on storm, drought and flood frequency and strength due to a change in the balance of the thermal heat in the oceans and atmosphere, with the poles heating faster (Herring et al, 2018). In addition, the greater heat being trapped in the polar regions means the temperature gradient with the lower latitudes drops and therefore the jet streams weaken and become more wavy, thereby creating more blocks of high pressure that lead to extreme weather (Kornhuber, et al 2019). We are witnessing negative impacts on agriculture. Climate change has reduced growth in crop yields by 1–2 percent per decade over the past century (Wiebe et al, 2015). The UN Food and Agriculture Organisation (FAO) reports that weather abnormalities related to climate change are costing billions of dollars a year, and growing exponentially. For now, the impact is calculated in money, but the nutritional implications are key (FAO, 2018). We are also seeing impacts on marine ecosystems. About half of the world's coral reefs have died in the last 30 years, due a mixture of reasons though higher water temperatures and acidification due to higher CO₂ concentrations in ocean water being key (Phys.org, 2018). In ten years prior to 2016 the Atlantic Ocean soaked up 50 percent more carbon dioxide than it did the previous decade, measurably speeding up the acidification of the ocean (Woosley et al, 2016). This study is indicative of oceans worldwide, and the consequent acidification degrades the base of the marine food web, thereby reducing the ability of fish populations to reproduce themselves across the globe (Britten et al, 2015). Meanwhile, warming oceans are already reducing the population size of some fish species (Aaron-Morrison et al, 2017). Compounding these threats to human nutrition, in some regions we are witnessing an exponential rise in the spread of mosquito and tick-borne viruses as temperatures become more conducive to them (ECJCR, 2018).

Looking Ahead

Most of the impacts I just summarised are already upon us and even without increasing their severity they will nevertheless increase their impacts on our ecosystems, soils, seas and our societies over time. It is difficult to predict future impacts. But it is more difficult not to predict them. Because the reported impacts today are at the very worst end of predictions being made in the early 1990s - back when I first studied climate change and model-based climate predictions as an undergraduate at Cambridge University. The models today suggest an increase in storm number and strength (Herring et al, 2018). They predict a decline of normal agriculture, including the compromising of mass production of grains in the northern hemisphere and intermittent disruption to rice production in the tropics. That includes predicted declines in the yields of rice, wheat, and corn in China by 36.25%, 18.26%, and 45.10%, respectively, by the end of this century (Zhang et al, 2016). Naresh Kumar et al. (2014) project a 6–23 and 15–25% reduction in the wheat yield in India during the 2050s and 2080s, respectively, under the mainstream projected climate change scenarios. The loss of coral and the acidification of the seas is predicted to reduce fisheries productivity by over half (Rogers et al, 2017). The rates of sea level rise suggest they may soon become exponential (Malmquist, 2018), which will pose significant problems for hundreds of millions of people living in coastal zones (Neumann et al, 2015). Environmental scientists are now describing our current era as the sixth mass extinction event in the history of planet Earth, with this one caused by us. About half of all plants and animal species in the world's most biodiverse places are at risk of extinction due to climate change (WWF, 2018). The World Bank reported in 2018 that countries needed to prepare for over 100 million internally displaced people due to the effects of climate change (Rigaud et al, 2018), in addition to millions of international refugees.

Despite you, me, and most people we know in this field, already hearing data on this global situation, it is useful to recap simply to invite a sober acceptance of our current predicament. It has led some commentators to describe our time as a new geological era shaped by humans - the Anthropocene (Hamilton, et al, 2015). It has led others to conclude that we should be exploring how to live in an unstable post-Sustainability situation (Benson and Craig, 2014; Foster, 2015). This context is worth being reminded of, as it provides the basis upon which to assess the significance, or otherwise, of all the praiseworthy efforts that have been underway and reported in some detail in this and other journals over the past decade. I will now offer an attempt at a summary of that broader context insofar as it might frame our future work on sustainability.

The politically permissible scientific consensus is that we need to stay beneath 2 degrees warming of global ambient temperatures, to avoid dangerous and uncontrollable levels of climate change, with impacts such as mass starvation, disease, flooding, storm destruction, forced migration and war. That figure was agreed by governments that were dealing with many domestic and international pressures from vested interests, particularly corporations. It is therefore not a figure that many scientists would advise, given that many ecosystems will be lost and many risks created if we approach 2 degrees global ambient warming (Wadhams, 2018). The IPCC agreed in 2013 that if the world does not keep further anthropogenic emissions below a total of 800 billion tonnes of carbon we are not likely to keep average temperatures below 2 degrees of global averaged warming. That left about 270 billion tonnes of carbon to burn (Pidcock, 2013). Total global emissions remain at around 11 billion tonnes of carbon per year (which is 37 billion tonnes of CO₂). Those calculations appear worrying but give the impression we have at least a decade to change. It takes significant time to change economic systems so if we are not already on the path to dramatic reductions it is unlikely we will keep within the carbon limit. With an increase of carbon emissions of 2% in 2017, the decoupling of economic activity from emissions is not yet making a net dent in global emissions (Canadell et al, 2017). So, we are not on the path to prevent going over 2 degrees warming through emissions reductions. In any case the IPCC estimate of a carbon budget was controversial. One scientist has calculated that the IPCC had underestimated the amount of methane release and therefore the carbon budget will be used up entirely by 2025 (Knorr, 2019).

That situation is why some experts have argued for more work on removing carbon from the atmosphere with machines. Unfortunately, the current technology needs to be scaled by a factor of 2 million within 2 years, all powered by renewables, alongside massive emission cuts, to reduce the amount of heating already locked into the system (Wadhams, 2018). Biological approaches to carbon capture appear far more promising (Hawken and Wilkinson, 2017). These include planting trees, restoring soils used in agriculture, and growing seagrass and kelp, amongst other approaches. They also offer wider beneficial environmental and social side effects. Studies on seagrass (Greiner et al, 2013) and seaweed (Flannery, 2015) indicate we could be taking millions of tonnes of carbon from the atmosphere immediately and continually if we had a massive effort to restore seagrass meadows and to farm seaweed. The net sequestration effect is still being assessed but in certain environments will be significant (Howard et al, 2017). Research into “management-intensive rotational grazing” practices (MIRG), also known as holistic grazing, show how a healthy grassland can store carbon. A 2014 study measured annual per-hectare increases in soil carbon at 8 tons per year on farms

converted to these practices (Machmuller et al, 2015). The world uses about 3.5 billion hectares of land for pasture and fodder crops. Using the 8 tons figure above, converting a tenth of that land to MIRC practices would sequester a quarter of present emissions. In addition, no-till methods of horticulture can sequester as much as two tons of carbon per hectare per year, so could also make significant contributions. It is clear, therefore, that our assessment of carbon budgets must focus as much on these agricultural systems as we do on emissions reductions.

Clearly a massive campaign and policy agenda to transform agriculture and restore ecosystems globally is needed right now. It will be a huge undertaking, undoing 60 years of developments in world agriculture. In addition, it means the conservation of our existing wetlands and forests must suddenly become successful, after decades of failure across lands outside of geographically limited nature reserves. Even if such will emerges immediately, the heating and instability already locked into the climate will cause damage to ecosystems, so it will be difficult for such approaches to curb the global atmospheric carbon level. The reality that we have progressed too far already to avert disruptions to ecosystems is highlighted by the finding that if CO₂ removal from the atmosphere could work at scale, it would not prevent massive damage to marine life, which is locked in for many years due to acidification from the dissolving of CO₂ in the oceans (Mathesius et al, 2015).

Despite the limitations of what humans can do to work with nature to encourage its carbon sequestration processes, the planet has been helping us out anyway. A global “greening” of the planet has significantly slowed the rise of carbon dioxide in the atmosphere since the start of the century. Plants have been growing faster and larger due to higher CO₂ levels in the air and warming temperatures that reduce the CO₂ emitted by plants via respiration. The effects led the proportion of annual carbon emissions remaining in the air to fall from about 50% to 40% in the last decade. However, this process only offers a limited effect, as the absolute level of CO₂ in the atmosphere is continuing to rise, breaking the milestone of 400 parts per million (ppm) in 2015. Given that changes in seasons, temperatures extremes, flood and drought are beginning to negatively affect ecosystems, the risk exists that this global greening effect may be reduced in time (Keenan et al, 2016)

These potential reductions in atmospheric carbon from natural and assisted biological processes is a flickering ray of hope in our dark situation. However, the uncertainty about their impact needs to be contrasted with the uncertain yet significant impact of increasing methane release in the atmosphere. It is a gas that enables far more trapping of heat from the sun’s rays than CO₂ but was significantly underestimated in most of the climate models since 2005, and ignored before then. Recent research is finding and predicting far higher levels of methane (Farquharson, et al, 2019; Lamarche-Gagnon, et al, 2019 and Nisbet, et al. 2019). The authors of the 2016 Global Methane Budget report found that in the early years of this century, concentrations of methane rose by only about 0.5ppb each year, compared with 10ppb in 2014 and 2015. Various sources were identified, from fossil fuels - to agriculture to melting permafrost (Saunois et al, 2016).

Given the contentiousness of this topic in the scientific community, it may even be contentious for me to say that there is no scientific consensus on the sources of current methane emissions or the potential risk and timing of significant methane releases from either

surface and subsea permafrost. A recent attempt at consensus on methane risk from melting surface permafrost concluded methane release would happen over centuries or millennia, not this decade (Schuur et al. 2015). Yet within three years that consensus was broken by one of the most detailed experiments which found that if the melting permafrost remains waterlogged, which is likely, then it produces significant amounts of methane within just a few years (Knoblauch et al, 2018). The debate is now likely to be about whether other microorganisms might thrive in that environment to eat up the methane – and whether or not in time to reduce the climate impact.

The debate about methane release from clathrate forms, or frozen methane hydrates, on the Arctic sea floor is even more contentious. In 2010 a group of scientists published a study that warned how the warming of the Arctic could lead to a speed and scale of methane release that would be catastrophic to life on earth through atmospheric heating of over 5 degrees within just a few years of such a release (Shakhova et al, 2010). The study triggered a fierce debate, much of which was ill considered, perhaps understandable given the shocking implications of this information (Ahmed, 2013). Since then, key questions at the heart of this scientific debate (about what would amount to the probable extinction of the human race) include the amount of time it will take for ocean warming to destabilise hydrates on the sea floor, and how much methane will be consumed by aerobic and anaerobic microbes before it reaches the surface and escapes to the atmosphere. In a global review of this contentious topic, scientists concluded that there is not the evidence to predict a sudden release of catastrophic levels of methane in the near-term (Ruppel and Kessler, 2017). However, a key reason for their conclusion was the lack of data showing actual increases in atmospheric methane at the surface of the Arctic, which is partly the result of a lack of sensors collecting such information. Most ground-level methane measuring systems are on land. Could that be why the unusual increases in atmospheric methane concentrations cannot be fully explained by existing data sets from around the world (Saunio et al, 2016)? The lack of easy-to-access and reputable analysis of the potential implications of real time atmospheric measurements, is bewildering for me.⁴ However, there has been “very strong” growth in methane concentrations between 2014 and 2017 (Nisbet, et al, 2019). A study in 2020 of methane release at the other pole, on the insufficient filtering effects of microbes, adds to concern that methane might be released in dangerous amounts from the seabed (Thurber, et al 2020).

These recent studies suggest that the recent attempt at a consensus that it is highly unlikely we will see near-term massive release of methane from the Arctic Ocean is sadly inconclusive. In 2017 scientists working on the Eastern Siberian sea shelf, reported that the permafrost layer has thinned enough to risk destabilising hydrates (The Arctic, 2017). That report of subsea permafrost destabilisation in the East Siberian Arctic sea shelf, the latest unprecedented temperatures in the Arctic, and the recent data on non-linear rises in high-atmosphere methane levels, combine to make it feel like we might be about to play Russian Roulette with the entire human race, with already two bullets loaded. Nothing is certain. But it is sobering that humanity has arrived at a situation of our own making where we now debate the strength of analyses of our near-term extinction.

⁴ https://www.esrl.noaa.gov/gmd/ccgg/trends_ch4/

Apocalypse Uncertain

The truly shocking information on the trends in climate change and its impacts on ecology and society are leading some to call for us to experiment with geoengineering the climate, from fertilizing the oceans so they photosynthesize more CO₂, to releasing chemicals in the upper atmosphere so the Sun's rays are reflected. The unpredictability of geoengineering the climate through the latter method, in particular the dangers of disturbances to seasonal rains that billions of people rely on, make it unlikely to be used (Keller et al, 2014). The potential natural geoengineering from increased sulphur releases from volcanoes due to isostatic rebound as weight on the Earth's crust is redistributed is not likely to make a significant contribution to earth temperatures for decades or centuries.

It is a truism that we do not know what the future will be. But we can see trends. We do not know if the power of human ingenuity will help sufficiently to change the environmental trajectory we are on. Unfortunately, the recent years of innovation, investment and patenting indicate how human ingenuity has increasingly been channelled into consumerism and financial engineering. We might pray for time. But the evidence before us suggests that we are set for disruptive and probably uncontrollable levels of climate change, bringing starvation, destruction, migration, disease and war (Servigne and Stevens, 2020).

It is difficult to assess how disruptive the impacts of climate change will be or where will be most affected, especially as economic and social systems will respond in complex ways. The evidence is mounting that the impacts will be catastrophic to our livelihoods and the societies that we live within. Our norms of behaviour, that we call our "civilisation," may also degrade. When I first wrote this paper in early 2018, I did not know about the fields of scholarship that relate to catastrophic risks and what is now called 'collapsology' (Servigne and Stevens, 2020). Those fields attempt to map how societies break down and how such collapses are likely to occur in future. I recommend exploring that literature, to look at how impacts on agriculture, international relations, social unease, crime, civil conflict, disease prevalence, financial stability, and so on, can cascade to create a breakdown of societies. In this paper I cannot prove the likelihood or certainty of societal collapse, and experts in the field of collapsology say that within such complex systems any attempt to prove within modalities of modern scholarship whether collapse will or will not happen would be futile. However, they also conclude that this does not mean that our limits in prediction within complex systems should not restrict us from sense-making about our predicament.

When we contemplate this possibility of 'societal collapse', it can seem abstract. The previous paragraphs may seem, subconsciously at least, to be describing a situation to feel sorry about as we witness scenes on TV or online. But when I say starvation, destruction, migration, disease and war, I mean in your own life. With the power down, soon you wouldn't have water coming out of your tap. You will depend on your neighbours for food and some warmth. You will become malnourished. You won't know whether to stay or go. You will fear being violently killed before starving to death.

These descriptions may seem overly dramatic. Some readers might consider them an unacademic form of writing. Which would be an interesting comment on why we even write at all. This is why the development of auto-ethnography within academia invites us to include

in our academic prose some novel ways of communicating that might create emotional connection with the reader (Adams, et al, 2015). I chose the words above as an attempt to cut through the sense that this topic is purely theoretical. As we are considering here a situation where the publishers of this journal would no longer exist, the electricity to read its outputs won't exist, and a profession to educate won't exist, I think it time we break some of the conventions of this format.

However, some of us may take pride in upholding the norms of the current society, even amidst collapse. Even though some of us might believe in the importance of maintaining norms of behaviour, as indicators of shared values, others will consider that the probability of collapse means that effort at reforming our current system is no longer the pragmatic choice. My conclusion to this situation has been that we need to expand our work on "sustainability" to consider how communities, countries and humanity can adapt to the coming troubles. I have dubbed this the "Deep Adaptation Agenda," to contrast it with the limited scope of current climate adaptation activities. My experience is that a lot of people are resistant to the conclusions I have just shared. So before explaining the implications, let us consider some of the emotional and psychological responses to the information I have just summarised.

Systems of Denial

It would not be unusual to feel a bit affronted, disturbed, or saddened by the information and arguments I have just shared. In the past few years, many people have said to me that "it can't be too late to stop climate change, because if it was, how would we find the energy to keep on striving for change?" With such views, a possible reality is denied because people want to continue their striving. What does that tell us? The "striving" is based in a rationale of maintaining self-identities related to espoused values. It is understandable why that happens. If one has always thought of oneself as having self-worth through promoting the public good, then information that initially appears to take away that self-image is difficult to assimilate.

That process of strategic denial to maintain striving and identity is easily seen in online debates about the latest climate science. One particular case is illustrative. In 2017 the New York Magazine published an article that drew together the latest data and analysis of what the implications of rapid climatic warming would be on ecosystems and humanity. Unlike the many dry academic articles on these subjects, this popular article sought to describe these processes in visceral ways (Wallace-Wells, 2017). The reaction of some environmentalists to this article did not focus on the accuracy of the descriptions or what might be done to reduce some of the worst effects that were identified in the article. Instead, they focused on whether such ideas should be communicated to the general public. Climate scientist Michael Mann warned against presenting "the problem as unsolvable, and feed[ing] a sense of doom, inevitability and hopelessness" (in Becker, 2017). Environmental journalist Alex Steffen (2017) tweeted that "Dropping the dire truth... on unsupported readers does not produce action, but fear." In a blog post, Daniel Aldana Cohen (2017) an assistant sociology professor working on climate politics, called the piece "climate disaster porn." Their reactions reflect what some people have said to me in professional environmental circles. The argument made is that to discuss the likelihood and nature of societal collapse due to climate change is irresponsible because it might trigger hopelessness amongst the general public. I always thought it odd to restrict our own exploration of reality and censor our own sensemaking due to our ideas

about how our conclusions might come across to others. Given that this attempt at censoring was so widely shared in the environmental field in 2017, it deserves some closer attention.

I see four particular insights about what is happening when people argue we should not communicate to the public the likelihood and nature of the catastrophe we face. First, it is not untypical for people to respond to data in terms of what perspectives we wish for ourselves and others to have, rather than what the data may suggest is happening. That reflects an approach to reality and society that may be tolerable in times of plenty but counterproductive when facing major risks. Second, bad news and extreme scenarios impact on human psychology. We sometimes overlook that the question of how they impact is a matter for informed discussion that can draw upon psychology and communications theories. Indeed, there are journals dedicated to environmental psychology. There is some evidence from social psychology to suggest that by focusing on impacts now, it makes climate change more proximate, which increases support for mitigation (McDonald et al, 2015). That is not conclusive, and this field is one for further exploration. That serious scholars or activists would make a claim about impacts of communication without specific theory or evidence suggests that they are not actually motivated to know the effect on the public but are attracted to a certain argument that explains their view.

A third insight from the debates about whether to publish information on the probable collapse of our societies is that sometimes people can express a paternalistic relationship between themselves as environmental experts and other people whom they categorise as “the public”. That is related to the non-populist anti-politics technocratic attitude that has pervaded contemporary environmentalism. It is a perspective that frames the challenges as one of encouraging people to try harder to be nicer and better rather than coming together in solidarity to either undermine or overthrow a system that demands we participate in environmental degradation.

A fourth insight is that “hopelessness” and its related emotions of dismay and despair are understandably feared but wrongly assumed to be entirely negative and to be avoided whatever the situation. Alex Steffen warned that “Despair is never helpful” (2017). However, the range of ancient wisdom traditions see a significant place for hopelessness and despair. Contemporary reflections on people’s emotional and even spiritual growth as a result of their hopelessness and despair align with these ancient ideas. The loss of a capability, a loved one or a way of life, or the receipt of a terminal diagnosis have all been reported, or personally experienced, as a trigger for a new way of perceiving self and world, with hopelessness and despair being a necessary step in the process (Matousek, 2008). In such contexts “hope” is not a good thing to maintain, as it depends on what one is hoping for. When the debate raged about the value of the New York Magazine article, some commentators picked up on this theme. “In abandoning hope that one way of life will continue, we open up a space for alternative hopes,” wrote Tommy Lynch (2017).

This question of valid and useful hope is something that we must explore much further. Leadership theorist Jonathan Gosling has raised the question of whether we, in modern industrial consumer societies, need a more “radical hope” in the context of climate change and a growing sense of “things falling apart” (Gosling, 2016). He invites us to explore what we could learn from other cultures that have faced catastrophe. Examining the way Native

American Indians coped with being moved on to reservations, Lear (2008) looked at what he calls the “blind spot” of any culture: the inability to conceive of its own destruction and possible extinction. He explored the role of forms of hope that involved neither denial or blind optimism. “What makes this hope radical, is that it is directed toward a future goodness that transcends the current ability to understand what it is” (ibid). He explains how some of the Native American chiefs had a form of “imaginative excellence” by trying to imagine what ethical values would be needed in their new lifestyle on the reservation. He suggests that besides the standard alternatives of freedom or death (in service of one’s culture) there is another way, less grand yet demanding just as much courage: the way of “creative adaptation.” This form of creatively constructed hope may be relevant to our Western civilisation as we confront disruptive climate change (Gosling and Case, 2013). It should be obvious to the reader that indigenous peoples today should be supported to fight such oppression and so not be forced to discover ‘radical hope’ in the same way. Quite the contrary, the coming collapse of industrial consumer societies means they can and must be both supported and learned about by people in modern urban cultures (Whyte et al, 2019). Such deliberations are few and far between in either the fields of environmental studies or management studies. It is to help break this semi-censorship of our own community of inquiry on sustainability that motivated me to write this article. Some scholarship has looked at the process of denial more closely. Drawing on sociologist Stanley Cohen, Foster (2015) identifies two subtle forms of denial – interpretative and implicative. If we accept certain facts but interpret them in a way that makes them “safer” to our personal psychology, it is a form of “interpretative denial”. If we recognise the troubling implications of these facts but respond by busying ourselves on activities that do not arise from a full assessment of the situation, then that is “implicative denial”. Foster argues that implicative denial is rife within the environmental movement, from dipping into a local Transition Towns initiative, signing online petitions, or renouncing flying, there are endless ways for people to be “doing something” without seriously confronting the reality of climate change.

There are three main factors that could be encouraging professional environmentalists in their denial that our societies will collapse in the near-term. The first is the way the natural scientific community operates. Eminent climate scientist James Hansen has always been ahead of the conservative consensus in his analyses and predictions. Using the case study of sea level rise, he threw light on processes that lead to “scientific reticence” to conclude and communicate scenarios that would be disturbing to employers, funders, governments and the public (Hansen, 2007). A more detailed study of this process across issues and institutions found that climate-change scientists routinely underestimate impacts “by erring on the side of least drama” - (Brysse et al, 2013). Combined with the norms of scientific analysis and reporting to be cautious and avoid bombast, and the time it takes to fund, research, produce and publish peer-reviewed scientific studies, this means that the information available to environmental professionals about the state of the climate is not as frightening as it could be. In this paper I have had to mix information from peer-reviewed articles with recent data from individual scientists and their research institutions to provide the evidence which suggests we are now in a non-linear situation of climatic changes and effects.

A second set of factors influencing denial may be personal. George Marshall summarised the insights from psychology on climate denial, including the interpretive and implicative denial of those who are aware but have not prioritised it. In particular, we are social beings and our

assessment of what to do about information is influenced by our culture. Therefore, people often avoid voicing certain thoughts when they go against the social norm around them and/or their social identity. Especially in situations of shared powerlessness, it can be perceived as safer to hide one's views and do nothing if it goes against the status quo. Marshall also explains how our typical fear of death means that we do not give our full attention to information that reminds us of that. According to anthropologist Ernest Becker (1973): "A fear of death lies at the centre of all human belief." Marshall explains: "The denial of death is a 'vital lie' that leads us to invest our efforts into our cultures and social groups to obtain a sense of permanence and survival beyond our death. Thus, [Becker] argued, when we receive reminders of our death – what he calls death salience – we respond by defending those values and cultures." This view was recently expounded as part of the "terror management theory" proposed by Jeff Greenberg, Sheldon Solomon, and Tom Pyszczynski (2015). Although Marshall does not consider it directly, these processes would apply more so to "collapse denial" than to climate denial, as the death involves not only oneself but all of what one could contribute to.

These personal processes are likely made worse for sustainability experts than the general public, given the typical allegiance of professionals to incumbent social structures. Research has revealed that people who have a higher level of formal education are more supportive of the existing social and economic systems than those that have less education (Schmidt, 2000). The argument is that people who have invested time and money in progressing to a higher status within existing social structures are more naturally inclined to imagine reform of those systems than their upending. This situation is accentuated if we assume our livelihood, identity and self-worth is dependent on the perspective that progress on sustainability is possible and that we are part of that progressive process.

The third factor influencing denial is institutional. I have worked for over 20 years within or with organisations working on the sustainability agenda, in non-profit, private and governmental sectors. In none of these sectors is there an obvious institutional self-interest in articulating the probability or inevitability of societal collapse. Not to members of your charity, not to consumers of your product, not to voters for your party. There are a few niche companies that benefit from a collapse discourse leading some people to seek to prepare by buying their products. This field may expand in future, at various scales of preparedness, which I return to below. But the internal culture of environmental groups remains strongly in favour of appearing effective, even when decades of investment and campaigning have not produced a net positive outcome on climate, ecosystems or many specific species.

Let us look at the largest environmental charity, WWF, as an example of this process of organisational drivers of implicative denial. I worked for them when we were striving towards all UK wood product imports being from sustainable forests by 1995. Then it became "well-managed" forests by 2000. Then targets were quietly forgotten while the potensiphonic language⁵ of solving deforestation through innovative partnerships remained. If the employees of the world's leading environmental groups were on performance related pay, they would probably owe their members and donors money by now. The fact that some readers may find such a comment to be rude and unhelpful highlights how our interests in

⁵ language that emphasizes power and supremacy

civility, praise and belonging within a professional community can censor those of us who seek to communicate uncomfortable truths in memorable ways (like that journalist in the New York Magazine).

These personal and institutional factors mean that environmental professionals may be some of the slowest to process the implications of the latest climate information. In 2017, a survey of more than 8,000 people across 8 different countries – Australia, Brazil, China, Germany, India, South Africa, the UK, and the US – asked respondents to gauge their perceived level of security as compared to two years ago in regards to global risks. A total of 61% said they felt more insecure, while only 18% said they felt more secure. On climate change, 48% of respondents strongly agreed that it is a global catastrophic risk, with an additional 36% of people tending to agree with that. Only 14% of respondents disagreed to some degree with the idea that climate change presented a catastrophic risk (Hill, 2017). This perspective on climate may help explain other survey data that suggests remarkable changes in how people view technology, progress, their society, and the future prospects for their children. A 2017 global survey found that only 13% of the public think the world is getting better, which is major change from the ten years before (Ipsos MORI, 2017). In the USA, polls indicate that belief in technology as a good force has been fading (Asay, 2013). This information may reflect a wider questioning of the idea that progress is always good and possible. Such a shift in perspective is indicated by opinion polls showing that far fewer people today than the last decade believe their children will have a better future than themselves (Stokes, 2017). Another indicator of whether people believe in their future is if they believe in the basis of their society. Studies have consistently found that more people are losing faith in electoral democracy and in the economic system (Bendell and Lopatin, 2017). The questioning of mainstream life and of progress is also reflected in the shift away from secular-rational values to traditional values that has been occurring worldwide since 2010 (World Values Survey, 2016). How do children feel about their futures? I have not found a large or longitudinal study on children's views of the future, but one journalist who asked children from 6 to 12 years old to paint what they expect the world in 50 years to be like generated mostly apocalyptic images (Banos Ruiz, 2017). This evidence suggests that the idea we "experts" need to be careful about what to tell "them" the "unsupported public" may be a narcissistic delusion in need of immediate remedy.

Emotional difficulties with realising the tragedy that is coming, and that is in many ways upon us already, are understandable. Yet these difficulties need to be overcome so we can explore what the implications may be for our work, lives and communities.

Framing After Denial

As a sense of calamity grows within the environmental movement, some argue against a focus on "carbon reductionism" for how it may limit our appreciation of why we face this tragedy and what to do about it (Eisenstein, 2018). I agree that climate change is not just a pollution problem, but an indicator of how our human psyche and culture became divorced from our natural habitat. However, that does not mean we should deprioritise the climate situation for a broader environmental agenda.

If we allow ourselves to accept that a climate-induced form of economic and societal collapse is now likely, then we can begin to explore the nature and likelihood of that collapse. That is when we discover a range of different views. Some frame the future as involving a collapse of this economic and social system, which does not necessarily mean a complete collapse of law, order, identity and values. Some regard that kind of collapse as offering a potential upside in bringing humanity to a post-consumerist way of life that would be more conscious of relationships between people and nature (Eisenstein, 2013). Some even argue that this reconnection with nature will generate hitherto unimaginable solutions to our predicament. Sometimes that view comes with a belief in the power of spiritual practices to influence the material world according to human intent. The perspective that natural or spiritual reconnection might save us from catastrophe is, however, a psychological response one could analyse as a form of denial.

Some analysts emphasise the unpredictable and catastrophic nature of this collapse, so that it will not be possible to plan a way to transition at either collective or small-scale levels to a new way of life that we might imagine as tolerable, let alone beautiful. Then others go further still and argue that the data can be interpreted as indicating climate change is now in a runaway pattern, with inevitable methane release from the seafloor leading to a rapid collapse of societies that will trigger multiple meltdowns of some of the world's 400 nuclear power-stations, leading to the extinction of the human race (McPherson, 2016). The author making that claim is controversial and unusual within the scientific community. In my own research I was unable to find evidence to support or refute this view on nuclear power stations, as studies just referred to radiation release from disasters where there was containment (such as Chernobyl and Fukushima). Aside from this uncertainty around nuclear, those people who consider that we face near-term human extinction can draw on the findings of geologists that the last mass extinction of life on earth, where 95% of species disappeared, was due to methane-induced rapid warming of the atmosphere (Lee, 2014; Brand et al, 2016). Although a far distance from *inevitable* human extinction, two reputable climate scientists have calculated that the human race now has a 20% chance of going extinct this century (Xu and Ramanathan, 2017).

With each of these framings – collapse, catastrophe, extinction – people describe different degrees of certainty. Different people speak of a scenario being possible, probable or inevitable. In my conversations with both professionals in sustainability or climate, and others not directly involved, I have found that people choose a scenario and a probability depending not on what the data and its analysis might suggest, but what they are choosing to live with as a story about this topic. That parallels findings in psychology that none of us are purely logic machines but relate information into stories about how things relate and why (Marshall, 2014). None of us are immune to that process. Currently, I have chosen to interpret the information as indicating inevitable collapse, probable catastrophe and possible extinction. I do not prove in this paper that societal collapse is inevitable, as that would require more discussion of complex social, economic, political and cultural processes, but it is my personal conclusion from an overview of those factors which I have not yet published (and which seems reasonable to share with the reader given the seriousness of the matter).

There is a growing community of people who conclude we face inevitable human extinction and treat that view as a prerequisite for meaningful discussions about the implications for our

lives right now. For instance, there are thousands of people on Facebook groups who believe human extinction is near. In such groups I have witnessed how people who doubt extinction is either inevitable or coming soon are disparaged by some participants for being weak and deluded. This could reflect how some of us may find it easier to believe in a certain than an uncertain story, especially when the uncertain future would be so different to today that it is difficult to comprehend. Reflection on the end of times, or eschatology, is a major dimension of the human experience, and the total sense of loss of everything one could ever contribute to is an extremely powerful experience for many people. How they emerge from that experience depends on many factors, with loving kindness, creativity, transcendence, anger, depression, nihilism and apathy all being potential responses. Given the potential spiritual experience triggered by sensing the imminent extinction of the human race, we can appreciate why a belief in the inevitability of extinction could be a basis for some people to come together.

In my work with mature students, I have found that inviting them to consider collapse as inevitable, catastrophe as probable and extinction as possible, has not led to apathy or depression. Instead, in a supportive environment, where we have enjoyed community with each other, celebrating ancestors and enjoying nature before then looking at this information and possible framings for it, something positive happens. I have witnessed a shedding of concern for conforming to the status quo, and a new creativity about what to focus on going forward. Despite that, a certain discombobulation occurs and remains over time as one tries to find a way forward in a society where such perspectives are uncommon. Continued sharing about the implications as we transition our work and lives is valuable.

One further factor in the framing of our situation concerns timing. Which also concerns geography. Where and when will the collapse or catastrophe begin? When will it affect my livelihood and society? Has it already begun? Although it is difficult to forecast and impossible to predict with certainty, that does not mean we should not try. The current data on temperature rise at the poles and impacts on weather patterns around the world suggests we are already in the midst of dramatic changes that will impact massively and negatively on agriculture within the next twenty years. Impacts have already begun. That sense of near-term disruption to our ability to feed ourselves and our families, and the implications for crime and conflict, adds another level to the discombobulation I mentioned. Should you drop everything now and move somewhere more suitable for self-sufficiency? Should you be spending time reading the rest of this article? Should I even finish writing it? Some of the people who believe that we face inevitable extinction believe that no one will read this article because we will see a collapse of civilisation in the next twelve months when the harvests fail across the northern hemisphere. They see societal collapse leading to immediate meltdowns of nuclear power stations and thus human extinction being a near-term phenomenon. Certainly not more than five years from now. The clarity and drama of their message is why Inevitable Near Term Human Extinction (INTHE) has become a widely used phrase online for discussions about climate-collapse.

Although I do not currently agree with them, writing about that perspective makes me sad. Even four years after I first let myself consider near-term extinction properly, not as something to dismiss, it still makes my jaw drop, eyes moisten, and air escape my lungs. I have seen how the idea of INTHE can lead me to focus on truth, love and joy in the now, which is

wonderful, but how it can also make me lose interest in planning for the future. And yet I always come around to the same conclusion – we do not know. Ignoring the future because it is unlikely to matter might backfire. “Running for the hills” – to create our own eco-community – might backfire. But we definitely know that continuing to work in the ways we have done until now is not just backfiring – it is holding the gun to our own heads. With this in mind, we can choose to explore how to evolve what we do, without any simple answers. In my post-denial state, shared by increasing numbers of my students and colleagues, I realised that we would benefit from conceptual maps for how to address these questions. I therefore set about synthesising the main things people talked about doing differently in light of a view of inevitable collapse and probable catastrophe. That is what I offer now as the “deep adaptation agenda.”

The Deep Adaptation Agenda

For many years, discussions and initiatives on adaptation to climate change were seen by environmental activists and policymakers as unhelpful to the necessary focus on carbon emissions reductions. That view finally changed in 2010 when the IPCC gave more attention to how societies and economies could be helped to adapt to climate change, and the United Nations Global Adaptation Network was founded to promote knowledge sharing and collaboration. Five years later the Paris Accord between member states produced a “Global Goal on Adaptation” (GGA) with the aim of “enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the global temperature goal” (cited in Singh, Harmeling and Rai, 2016). Countries committed to develop National Adaptation Plans (NAPs) and report on their creation to the UN.

Since then the funding being made available to climate adaptation has grown, with all the international development institutions active on adaptation finance. In 2018 the International Fund for Agricultural Development (IFAD), African Development Bank (AfDB), Asian Development Bank (ADB), Global Facility for Disaster Reduction and Recovery (GFDRR) and the World Bank each agreed major financing for governments to increase resilience of their communities. Some of their projects include the Green Climate Fund, which was created to provide lower income countries with assistance. Typical projects include improving the ability of small-scale farmers to cope with weather variability through the introduction of irrigation and the ability of urban planners to respond to rising sea levels and extreme rainfall events through reengineering drainage systems (Climate Action Programme, 2018). These initiatives are falling short of the commitments made by governments over the past 8 years, and so more is being done to promote private bonds to finance adaptation (Bernhardt, 2018) as well as stimulate private philanthropy on this agenda (Williams, 2018).

These efforts are paralleled by an increased range of activities under the umbrella of “Disaster Risk Reduction” which has its own international agency – the United Nations International Strategy for Disaster Reduction (UNISDR). The aim of their work is to reduce the damage caused by natural hazards like earthquakes, floods, droughts and cyclones, through reducing sensitivity to these hazards as well as increasing the capacity to respond when disasters hit. That focus means significant engagement with urban planners and local governments. In the business sector, this disaster risk reduction agenda meets the private sector through the well-

established fields of risk management and business continuity management. Companies ask themselves what the points of failure might be in their value chains and seek to reduce those vulnerabilities or the significance of something failing.

Given the climate science we discussed earlier, some people may think this action is too little too late. Yet, if such action reduces some harm temporarily, that will help people, just like you and me, and therefore such action should not be disregarded. Nevertheless, we can look more critically at how people and organisations are framing the situation and the limitations that such a framing may impose. The initiatives are typically described as promoting “resilience”, rather than sustainability. Some definitions of resilience within the environmental sector are surprisingly upbeat. For instance, the Stockholm Resilience Centre (2015) explains that “resilience is the capacity of a system, be it an individual, a forest, a city or an economy, to deal with change and continue to develop. It is about how humans and nature can use shocks and disturbances like a financial crisis or climate change to spur renewal and innovative thinking.” In offering that definition, they are drawing on concepts in biology, where ecosystems are observed to overcome disturbances and increase their complexity (Brand and Jax, 2007).

Two issues require attention at this point. First, the upbeat allegiance to “development” and “progress” in certain discourses about resilience may not be helpful as we enter a period when material “progress” may not be possible and so aiming for it might become counter-productive. Second, apart from some limited soft skills development, the initiatives under the resilience banner are nearly all focused on physical adaptation to climate change, rather than considering a wider perspective on psychological resilience. In psychology, “resilience is the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress — such as family and relationship problems, serious health problems or workplace and financial stressors. It means ‘bouncing back’ from difficult experiences” (American Psychology Association, 2018). How a person “bounces back” after difficulties or loss, may be through a creative reinterpretation of identity and priorities. The concept of resilience in psychology does not, therefore, assume that people return to how they were before. Given the climate reality we now face, this less progressivist framing of resilience is more useful for a deeper adaptation agenda.

In pursuit of a conceptual map of “deep adaptation,” we can conceive of resilience of human societies as the capacity to adapt to changing circumstances so as to survive with valued norms and behaviours. Given that some analysts are concluding that a societal collapse is now likely, inevitable, or already occurring, the question becomes: What are the valued norms and behaviours that human societies will wish to maintain as they seek to survive? That highlights how deep adaptation will involve more than “resilience.” It brings us to a second area of this agenda, which I have named “relinquishment.” It involves people and communities letting go of certain assets, behaviours and beliefs where retaining them could make matters worse. Examples include withdrawing from coastlines, shutting down vulnerable industrial facilities, or giving up expectations for certain types of consumption. The third area can be called “restoration.” It involves people and communities rediscovering attitudes and approaches to life and organisation that our hydrocarbon-fuelled civilisation eroded. Examples include re-wilding landscapes, so they provide more ecological benefits and require less management, changing diets back to match the seasons, rediscovering non-electronically powered forms of

play, and increased community-level productivity and support. A fourth area for Deep Adaptation is what could be termed “reconciliation.” That is in recognition of how we do not know whether our efforts will make a difference, while we also know that our situations will become more stressful and disruptive, ahead of the ultimate destination for us all. How we reconcile with each other and with the predicament we must now live with will be key to how we avoid creating more harm by acting from suppressed panic (Bendell, 2019).

It is not my intention in this paper to map out more specific implications of a deep adaptation agenda. Indeed, it is impossible to do so, and to attempt it would assume we are in a situation for calculated attempts at management, when what we face is a complex predicament beyond our control. Rather, I hope the deep adaptation agenda of resilience, relinquishment and restoration can be a useful framework for community dialogue in the face of climate change. Resilience asks us “how do we keep what we really want to keep?” Relinquishment asks us “what do we need to let go of in order to not make matters worse?” Restoration asks us “what can we bring back to help us with the coming difficulties and tragedies?” Reconciliation asks “with what and whom can we make peace with as we face our mutual mortality?” In 2017, part of this deep adaptation agenda was used to frame a festival of alternatives organised by Peterborough Environment City Trust. It included a whole day devoted to exploring what relinquishment could involve. As such, it allowed more open conversation and imagination than a narrower focus on resilience. Further events are planned across the UK. Whether it will be useful framing for a broader-level policy agenda is yet to be seen.

How does this “deep adaptation agenda” relate to the broad conceptual framework of sustainable development? It is related to other perspectives that despite the attention of international institutions to “sustainable development goals,” the era of “sustainable development” as unifying concept and goal is now ending. It is an explicitly post-sustainability framing, and part of the Restoration Approach to engaging with social and environmental dilemmas, as I outlined elsewhere (Bendell, et al 2017).

Research Futures in the Face of Climate Tragedy

I was only partly joking earlier when I questioned why I was even writing this paper. If all the data and analysis turn out to be misleading, and this society continues nicely for the coming decades, then this article will not have helped my career. If the predicted collapse comes within the next decade, then I won’t have a career. It is the perfect lose-lose. I mention this to highlight how it will not be easy to identify ways forward as academic researchers and educators in the field of organisational sustainability. For the academics reading this paper, most of you will have increasing teaching loads, in areas where you are expected to cover certain content. I know you may have little time and space for reinventing your expertise and focus. Those of you who have a mandate to research might discover that the deep adaptation agenda is not an easy topic for finding research partners and funders. This restrictive situation was not always the reality faced by academics. It is the result of changes in higher education, that are one expression of an ideology that has made the human race so poor at addressing a threat to its wellbeing and even existence. It is an ideology that many of us have been complicit in promoting, if we have been working in business schools. It is important to recognise that complicity, before considering how to evolve our research in the face of the climate tragedy (Bendell, 2020).

The West's response to environmental issues has been restricted by the dominance of neoliberal economics since the 1970s. That led to hyper-individualist, market fundamentalist, incremental and atomistic approaches. By hyper-individualist, I mean a focus on individual action as consumers, switching light bulbs or buying sustainable furniture, rather than promoting political action as engaged citizens. By market fundamentalist, I mean a focus on market mechanisms like the complex, costly and largely useless carbon cap and trade systems, rather than exploring what more government intervention could achieve. By incremental, I mean a focus on celebrating small steps forward such as a company publishing a sustainability report, rather than strategies designed for a speed and scale of change suggested by the science. By atomistic, I mean a focus on seeing climate action as a separate issue from the governance of markets, finance and banking, rather than exploring what kind of economic system could permit or enable sustainability (ibid).

This ideology has now influenced the workloads and priorities of academics in most universities, which restricts how we can respond to the climate tragedy. In my own case, I took an unpaid sabbatical, and writing this paper is one of the outcomes of that decision. We no longer have time for the career games of aiming to publish in top-ranked journals to impress our line managers or improve our CV for if we enter the job market. Nor do we have a need for the narrow specialisms that are required to publish in such journals. So, yes, I am suggesting that in order to let oneself evolve in response to the climate tragedy one may have to quit a job – and even a career. However, if one is prepared to do that, then one can engage with an employer and professional community from a new place of confidence.

If staying in academia, I recommend you begin to ask some questions of all that you research and teach. When reading others' research, I recommend asking: "How might these findings inform efforts for a more massive and urgent pursuit of resilience, relinquishment and restoration in the face of social collapse?" You may find that most of what you read offers little on that question, and, therefore, you no longer wish to engage with it. On one's own research, I recommend asking: "If I didn't believe in incremental incorporation of climate concerns into current organisations and systems, what might I want to know more about?" In answering that question, I recommend talking to non-specialists as much as people in your own field, so that you are able to talk more freely and consider all options.

In my own work, I stopped researching corporate sustainability. I learned about leadership and communications and began to research, teach and advise on these matters, in the political arena. I began to work on systems to enable re-localisation of economies and support for community development, particular those systems using local currencies. I sought to share that knowledge more widely, and therefore launched a free online course (The Money and Society Mass Open Online Course). I began to spend more time reading and talking about the climate tragedy and what I might do, or stop doing, with that in mind. This rethinking and repositioning is ongoing, but I can no longer work on subjects that do not have some relevance to deep adaptation. Looking ahead, I see the need and opportunity for more work at multiple levels. People will need more support to access information and networks for how to attempt a shift in their livelihoods and lifestyles. Existing approaches to living off-grid in intentional communities are useful to learn from, but this agenda needs to go further in asking questions like how small-scale production of drugs like aspirin is possible. Free online and in-person courses as well as support networks on self-sufficiency need to be scaled. Local

governments will need similar support on how to develop the capabilities today that will help their local communities to collaborate, not fracture, during a collapse. For instance, they will need to roll out systems for productive cooperation between neighbours, such as product and service exchange platforms enabled by locally issued currency. At the international level, there is the need to work on how to responsibly address the wider fallout from collapsing societies (Harrington, 2016). These will be many, but obviously include the challenges of refugee support and the securing of dangerous industrial and nuclear sites at the moment of a societal collapse.

Other intellectual disciplines and traditions may be of interest going forward. Human extinction and the topic of eschatology, or the end of the world, is something that has been discussed in various academic disciplines, as you might expect. In theology it has been widely discussed, while it also appears in literary theory as an interesting element to creative writing and in psychology during the 1980s as a phenomenon related to the threat of nuclear war. The field of psychology seems to be particularly relevant going forward.

Whatever we choose to work on in future will not be a simple calculation. It will be shaped by the emotional or psychological implications of this new awareness of a societal collapse being likely in our own lifetimes. I have explored some of these emotional issues and how they have been affecting my work choices, in a reflective essay on the spiritual implications of climate despair (Bendell, 2018). I recommend giving yourself time for such reflection and evolution, rather than rushing in to a new agenda of research or teaching. If you are a student, then I recommend sending your lecturers this paper and inviting a class discussion about these ideas. It is likely that those who are not embedded within the existing system will be the ones more able to lead this agenda.

I think it may be our vanity as academics to think that anyone but academics and students read academic papers. Therefore, I have chosen to leave my recommendations for managers, policy makers and lay persons for another outlet (see www.jembendell.com for my writings on various aspects of the Deep Adaptation agenda and community, including topics of campaign strategy, social justice, re-localisation, decolonisation, financial reform, psychology and spirituality).

Conclusions

Since records began in 1850, seventeen of the eighteen hottest years have occurred since 2000. Important steps on climate mitigation and adaptation have been taken over the past decade. However, these steps could now be regarded as equivalent to walking up a landslide. If the landslide had not already begun, then quicker and bigger steps would get us to the top of where we want to be. Sadly, the latest climate data, emissions data and data on the spread of carbon-intensive lifestyles show that the landslide has already begun. As the point of no return can't be fully known until after the event, ambitious work on reducing carbon emissions and extracting more from the air (naturally and synthetically) is more critical than ever. That must involve a new front of action on methane.

Disruptive impacts from climate change are now inevitable. Geoengineering is likely to be ineffective or counter-productive. Therefore, the mainstream climate policy community now

recognises the need to work much more on adaptation to the effects of climate change. That must now rapidly permeate the broader field of people engaged in sustainable development as practitioners, researchers and educators. In assessing how our approaches could evolve, we need to appreciate what kind of adaptation is possible. Recent research suggests that human societies will experience disruptions to their basic functioning within less than ten years due to climate stress. Such disruptions include increased levels of malnutrition, starvation, disease, civil conflict and war – and will not avoid affluent nations. This situation makes redundant the reformist approach to sustainable development and related fields of corporate sustainability that has underpinned the approach of many professionals (Bendell et al, 2017). Instead, a new approach which explores how to reduce harm and not make matters worse is important to develop. In support of that challenging, and ultimately personal process, understanding a deep adaptation agenda may be useful.

References

- Aaron-Morrison et. al. (2017), "State of the climate in 2016", *Bulletin of the American Meteorological Society*, Vol. 98, No. 8, p.Si-S280
- Adams, T. et al. (2015) *Autoethnography*. New York: Oxford University Press.
- Ahmed, N. (2013), "Seven facts you need to know about the Arctic methane timebomb," *The Guardian*, 5 August. Available at: <https://www.theguardian.com/environment/earth-insight/2013/aug/05/7-facts-need-to-know-arctic-methane-time-bomb> (accessed 24 March 2018)
- American Psychology Association (2018), "The Road to Resilience." Available at: www.apa.org/helpcenter/road-resilience.aspx (accessed 24 March 2018)
- Arctic News* (2018), "Warning Signs," 3 March. Available at: <https://arctic-news.blogspot.co.id/2018/03/warning-signs.html> (accessed 24 March 2018)
- Asay, M. (2013), "Americans Losing Faith In Technology, But Can't Break The Addiction," *Readwrite.com*, 12 September. Available at: <https://readwrite.com/2013/09/12/americans-losing-faith-in-technology-but-cant-break-the-addiction/> (accessed 24 March 2018)
- Banos Ruiz, I. (2017) "This apocalyptic is how kids are imagining our climate future," *DW.com*. Available at: www.dw.com/en/this-apocalyptic-is-how-kids-are-imagining-our-climate-future/a-40847610 (accessed 24 March 2018)
- Becker, E. (1973), *The Denial of Death*, Simon & Schuster, New York, NY.
- Becker, R. (2017), "Why scare tactics won't stop climate change: Doomsday scenarios don't inspire action," *The Verge*, 11 July. Available at: <https://www.theverge.com/2017/7/11/15954106/doomsday-climate-science-apocalypse-new-york-magazine-response> (accessed 24 March 2018)
- Bendell, J. (2018), "After Climate Despair – One Tale Of What Can Emerge," *Jembendell.com*, 14 January. Available at: <https://jembendell.wordpress.com/2018/01/14/after-climate-despair-one-tale-of-what-can-emerge/> (accessed 24 March 2018)
- Bendell, J. (2019) "Hope and Vision in the Face of Collapse: The 4th R of Deep Adaptation," *jembendell.com*, 9 January. Available at: <https://jembendell.com/2019/01/09/hope-and-vision-in-the-face-of-collapse-the-4th-r-of-deep-adaptation/> (accessed 26 July 2020).

Bendell, J. (2020) "The Collapse of Ideology and the End of Escape", *jembendell.com*, 28 June. Available at: <https://jembendell.com/2020/06/28/the-collapse-of-ideology-and-the-end-of-escape/> (accessed 26 July 2020).

Bendell, J. and Lopatin, M. (2016), "Democracy Demands a Richer Britain," *Huffington Post*, 2 December. Available at: http://www.huffingtonpost.co.uk/jem-bendell/democracy-demands-a-riche_b_13348586.html (accessed 24 March 2018)

Bendell, J., Sutherland, N. and Little, R. (2017), "Beyond unsustainable leadership: critical social theory for sustainable leadership", *Sustainability Accounting, Management and Policy Journal*, Vol. 8 Issue: 4, pp.418-444. Available at: <https://doi.org/10.1108/SAMPJ-08-2016-0048> (accessed 24 March 2018)

Benson, M. and Craig, R. (2014), "The End of Sustainability," *Society and Natural Resources*, vol.27, pp.777-782

Bernhardt, A. (2018), "Bonds: How To Finance Climate Adaptation," *Brinknews.com*, 19 February. Available at: <http://www.brinknews.com/bonds-how-to-finance-climate-adaptation/> (accessed 24 March 2018)

Brand, F. S., and Jax, K. (2007), "Focusing the meaning(s) of resilience: resilience as a descriptive concept and a boundary object." *Ecology and Society*, vol.12, issue 1, p.23. Available at: <http://www.ecologyandsociety.org/vol12/iss1/art23/> (accessed 24 March 2018)

Brand, U., Blarney, N., Garbelli, C., et al. (2016), "Methane Hydrate: Killer cause of Earth's greatest mass extinction." *Palaeoworld*, vol.25, issue 4, pp.496-507.

Britten, G. L., Dowd, M. and Worm, B. (2015), "Changing recruitment capacity in global fish stocks," *Proceedings of the National Academy of Sciences*. Published ahead of print December 14, 2015. Available at: www.pnas.org/content/early/2015/12/09/1504709112 (accessed 24 March 2018)

Brysse, K., Reskes, N., O'Reilly, J. and Oppenheimer, M. (2013), "Climate change prediction: Erring on the side of least drama?" *Global Environmental Change*, Volume 23, Issue 1, pp.327-337. Available at: <https://www.sciencedirect.com/science/article/pii/S0959378012001215> (accessed 24 March 2018).

Canadell, P., Le Quéré, C., Peters, G., Andrew, R., Jackson, R. and Haverd, V. (2017), "Global Carbon Budget 2017", *Globalcarbonproject.org*. Available at: <http://www.globalcarbonproject.org/carbonbudget/index.htm> (accessed 24 March 2018).

Clément, V. and J. Rivera (2016) From Adaptation to Transformation: An Extended Research Agenda for Organizational Resilience to Adversity in the Natural Environment, *Organisation and Environment*, Volume: 30 issue: 4, page(s): 346-365

Climate Action Programme (2018), "\$1 billion of new funding announced for climate adaptation projects," *Climateactionprogramme.org*, 2 March. Available at: <http://www.climateactionprogramme.org/news/1-billion-of-new-funding-announced-for-climate-adaptation-projects> (accessed 24 March 2018).

Cohen, D. A. (2017), "The Power and Peril of 'Climate Disaster Porn'," *New Republic*, 11 July. Available at: <https://newrepublic.com/article/143788/power-peril-climate-disaster-porn> (accessed 24 March 2018).

Copernicus Programme (2020) Surface air temperature for June 2020, <https://climate.copernicus.eu/surface-air-temperature-june-2020> (Accessed 26 July).

de Sousa Fragoso, R.M., C.J. de Almeida Noéme (2018) Economic effects of climate change on the Mediterranean's irrigated agriculture, *Sustainability Accounting, Management and Policy Journal*, Volume: 9 Issue: 2, 2018

European Commission Joint Research Centre (2018), "Climate change promotes the spread of mosquito and tick-borne viruses." *ScienceDaily*, 16 March. Available at: www.sciencedaily.com/releases/2018/03/180316111311.htm (accessed 24 March 2018).

Eisenstein, C. (2013), *The More Beautiful World Our Hearts Know Is Possible*, North Atlantic Books, Berkeley, California.

Eisenstein, C. (2018 forthcoming), *Climate - A New Story*, North Atlantic Books, Berkeley, California.

Farquharson, L. M., Romanovsky, V.E., Cable, W. L., Walker, D. A., Kokelj, S. V., & Nicolsky, D. (2019). "Climate change drives widespread and rapid thermokarst development in very cold permafrost in the Canadian High Arctic. *Geophysical Research Letters*, 46. Available at <https://doi.org/10.1029/2019GL082187>

Flannery, T. (2015) *Atmosphere of Hope: Searching for Solutions to the Climate Crisis*. Atlantic Monthly Press, New York, NY. p. 41.

Food and Agriculture Organisation (2018), "Disasters causing billions in agricultural losses, with drought leading the way," Press Release, 15 March.

Foster, J. (2015), *After Sustainability*. Earthscan/Routledge, Abingdon.

Gosling, J. (2016), "Will we know what counts as good leadership if 'Things Fall Apart?' Questions prompted by Chinua Achebe's novel," *Leadership*, vol.13, Issue 1, pp.35-47.

Gosling, J. and Case, P. (2013) "Social dreaming and ecocentric ethics: Sources of non-rational insight in the face of climate change catastrophe," *Organization*, vol.20, issue 5, pp.705-721.

Greenberg, J., Solomon, S. and Pyszczynski, T. (2015), *The Worm at the Core: On the Role of Death in Life*. Random House.

Greiner, J.T., McGlathery, K.J., Gunnell, J., and McKee, B.A. (2013), "Seagrass Restoration Enhances 'Blue Carbon' Sequestration in Coastal Waters." *PLoS ONE*, vol. 8, issue 8: e72469. Available at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0072469> (accessed 24 March 2018).

Hamilton, C. (2010), *Requiem for a Species*, Earthscan, London.

Hamilton, C. et al. (eds.) (2015), *The Anthropocene and the Global Environmental Crisis*, Routledge, Abingdon.

Hansen, J.E. (2007), "Scientific reticence and sea level rise," *Environmental Research Letters*, Volume 2, Number 2. Available at: <http://iopscience.iop.org/article/10.1088/1748-9326/2/2/024002> (accessed 24 March 2018).

Harrington, C. (2016) The Ends of the World: International Relations and the Anthropocene, *Millennium: Journal of International Studies*, Volume: 44 issue: 3, page(s): 478-498

Hawken, P. and Wilkinson, K. (2017), *Drawdown*, Penguin Books.

Henley, B. J. & King, A. D. (2017) *Geophys. Res. Lett.* 44, 4256–4262.
<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017GL073480>

Herrando-Pérez, S. Corey J A Bradshaw, Stephan Lewandowsky, David R Vieites. Statistical Language Backs Conservatism in Climate-Change Assessments. *BioScience*, 2019; 69 (3): 209
<https://www.sciencedaily.com/releases/2019/03/190320102010.htm>

Herring, S.C., Christidis, N., Hoell, A., Kossin, J.P., Schreck III, C.J., and Stott, P.A. (2018), "Explaining Extreme Events of 2016 from a Climate Perspective," *Special Supplement to the Bulletin of the American Meteorological Society*, Vol. 99, No. 1.

Hill, J.S. (2017), "Global Attitudes To Climate Change Risks Show Increasing Concern," *Cleantechnica*, 29 May. Available at: <https://cleantechnica.com/2017/05/29/global-attitudes-climate-change-risks-show-increasing-concern> (accessed 24 March 2018).

Howard et. al. (2017), "CO₂ released by carbonate sediment production in some coastal areas may offset the benefits of seagrass 'Blue Carbon' storage," *Limnology and Oceanography*, vol.63, issue 1, pp.160-172.

Hudson, S. R. (2011) Estimating the global radiative impact of the sea ice–albedo feedback in the Arctic, *J. Geophys. Res.*, 116, D16102, doi:10.1029/2011JD015804.

Ipsos MORI (2017), Tweet on 7 December. Available at: <https://mobile.twitter.com/IpsosMORI/status/938492368659116033> (accessed 24 March 2018).

Jamieson, D. (2014), *Reason in a Dark Time*, Oxford University Press, Oxford.

Johnson, J. (2019) 'Terrifying' New Climate Models Warn of 6-7°C of Warming by 2100 If Emissions Not Slashed, *Common Dreams*, September 17, 2019.
<https://www.commondreams.org/news/2019/09/17/terrifying-new-climate-models-warn-6-7degc-warming-2100-if-emissions-not-slashed>

JPL/PO.DAAC (2018), "Key Indicators: Global Mean Sea Level," *NASA.gov*. Available at: <https://sealevel.nasa.gov/understanding-sea-level/key-indicators/global-mean-sea-level> (accessed 17 March 2018).

Kahn, B. (2017), "The Arctic Has Been Crazy Warm All Year. This Is What It Means for Sea Ice," *Climate Central*, 6 July. Available at: www.climatecentral.org/news/arctic-crazy-warm-sea-ice-21599 (accessed 24 March 2018).

Keenan, T.F., Prentice, I.C., Canadell, J.G., Williams, C.G., Wang, H., Raupach, M. and Collatz, G.J. (2016), "Recent pause in the growth rate of atmospheric CO₂ due to enhanced terrestrial carbon uptake," *Nature Communications*, Volume 7, Article number: 13428.

Keller, D.P., Feng, E.Y. and Oschlies, A. (2014), "Potential climate engineering effectiveness and side effects during a high carbon dioxide-emission scenario," *Nature Communications*, vol. 5. Available at: <https://www.nature.com/articles/ncomms4304> (accessed 24 March 2018).

Knoblauch, C., Beer, C., Liebner, S., Grigoriev, M.N. and Pfeiffer, E.-M. (2018), "Methane Production as Key to the Greenhouse Gas Budget of Thawing Permafrost," *Nature Climate Change*, 19 March. Available at: <http://www.nature.com/articles/s41558-018-0095-z> (accessed 24 March 2018).

Knorr, W. (2019) Climate scientists should admit failure and move on, IFLAS, University of Cumbria.
<http://iflas.blogspot.com/2019/09/climate-scientists-should-admit-failure.html>

Kornhuber, Kai, Dim Coumou, Elisabeth Vogel, Corey Lesk, Jonathan F. Donges, Jascha Lehmann and Radley M. Horton (2019) "Amplified Rossby waves enhance risk of concurrent heatwaves in major

breadbasket regions”, 9 December 2019, *Nature Climate Change*. DOI: 10.1038/s41558-019-0637-z <https://www.nature.com/articles/s41558-019-0637-z.epdf?>

Lamarche-Gagnon, G. et al (2019) "Greenland melt drives continuous export of methane from the ice-sheet bed." *Nature* Vol. 565, pages 73–77. Available from <https://doi.org/10.1038/s41586-018-0800-0> (Accessed Jan 3, 2019)

Lear, J. (2008), *Radical Hope: Ethics in the Face of Cultural Devastation*, Harvard University Press, Boston, Mass.

Lee, H. (2014) “Alarming new study makes today’s climate change more comparable to Earth’s worst mass extinction,” *Skeptical Science*, 2 April. Available at: <https://skepticalscience.com/Lee-commentary-on-Burgess-et-al-PNAS-Permian-Dating.html> (accessed 24 March 2018).

Lenton, T. M. et al (2019) Climate tipping points — too risky to bet against: The growing threat of abrupt and irreversible climate changes must compel political and economic action on emissions, *Nature*, 27 November 2019

Nisbet, E. G., et al. (2019) “Very strong atmospheric methane growth in the four years 2014-2017: Implications for the Paris Agreement” *Global Biogeochemical Cycles* Vol. 3 Issue 33 pp 318-342, Available at <https://doi.org/10.1029/2018GB006009>

Lynch, T. (2017), “Why Hope Is Dangerous When It Comes to Climate Change: Global warming discussions need apocalyptic thinking,” *Slate*, 25 July. Available at: www.slate.com/Articles/technology/future_tense/2017/07/why_climate_change_discussions_need_apocalyptic_thinking.html (accessed 24 March 2018).

Lesnikowski, A.C., J.D. Ford, L. Berrang-Ford, M. Barrera, J. Heymann (2015) How are we adapting to climate change? A global assessment, *Mitigation and Adaptation Strategies for Global Change*, February 2015, Volume 20, Issue 2, pp 277–293

Machmuller, M.B, Kramer, M.G., Cyle, T.K, Hill, N., Hancock, D. and Thompson, A. (2015), “Emerging land use practices rapidly increase soil organic matter”, *Nature Communications*, vol. 6, Article number: 6995

Malmquist, D. (2018), “Researchers issue first-annual sea-level report cards,” *Phys.org*, 12 March. <https://m.phys.org/news/2018-03-issue-first-annual-sea-level-cards.html> (accessed 24 March 2018).

Marshall, G. (2014), *Don't Even Think About It: Why Our Brains Are Wired to Ignore Climate Change*, Bloomsbury USA, New York, NY.

Mathesius, S., Hofmann, M., Caldeira, K. and Schellnhuber, H.J. (2015), “Long-term response of oceans to CO2 removal from the atmosphere,” *Nature Climate Change*, volume 5, pp.1107–1113. Available at: www.nature.com/articles/nclimate2729 (accessed 24 March 2018).

Matousek, M. (2008), *When You Are Falling, Dive: Lessons in the Art of Living*, Bloomsbury USA, New York, NY.

McDonald, R.I, Chai, H.Y. and Newell, B.R. (2015), “Personal experience and the ‘psychological distance’ of climate change: An integrative review,” *Journal of Environmental Psychology*, vol. 44, pp.109-118

- McPherson, G. (2016), "Climate Change Summary and Update," *Guymcpherson.com*, 2 August. Available at: <https://guymcpherson.com/climate-chaos/climate-change-summary-and-update/> (accessed 24 March 2018).
- Mohanty et. al. (2012), "Rice and climate change: significance for food security and vulnerability", International Rice Research Institute, *CCAFS Working Paper 23*. CGIAR Research Program on Climate Change, Agriculture and Food Security.
- Mulgan, T. (2011), *Ethics for a Broken World*, Acumen, Durham.
- Naresh Kumar et. al. (2014), "Vulnerability of wheat production to climate change in India", *Climate Research*, vol.59, issue 3, pp.173-187
- NASA (2018), "Greenland Ice Loss 2002-2016", *NASA.gov*. Available at: <https://grace.jpl.nasa.gov/resources/30> (accessed 17 March 2018)
- NASA/GISS (2018), "Vital Signs: Global Temperature", *NASA.gov*. Available at: <https://climate.nasa.gov/vital-signs/global-temperature> (accessed 17 March 2018)
- Neumann, B., Vafeidis, A.T., Zimmermann, J., and Nicholls, R.J. (2015), "Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding - A Global Assessment," *PLoS One*, Vol. 10, Issue 3.
- NSIDC/NASA (2018), "Vital Signs: Arctic Sea Ice", *NASA.gov*. Available at: <https://climate.nasa.gov/vital-signs/arctic-sea-ice> (accessed 17 March 2018)
- Orsato, R. J., J. G. Ferraz de Campos, S.R. Barakat (2018) Social Learning for Anticipatory Adaptation to Climate Change: Evidence From a Community of Practice, Organization & Environment, *Organisation and Environment*.
- Pearce, F. (2013), "World won't cool without geoengineering, warns report," *New Scientist*, 25 September. Available at: <https://www.newscientist.com/article/dn24261-world-wont-cool-without-geoengineering-warns-report#.UkMIHYqhg> (accessed 24 March 2018).
- Phys.org* (2018), "The sorry state of Earth's species, in numbers," 16 March. Available at: <https://phys.org/news/2018-03-state-earth-species.html> (accessed 24 March 2018).
- Pidcock, R. (2013) "Carbon briefing: Making sense of the IPCC's new carbon budget," *Carbonbrief.org*, 23 October. Available at: <https://www.carbonbrief.org/carbon-briefing-making-sense-of-the-ipccs-new-carbon-budget> (accessed 24 March 2018).
- Pistone, K., Eisenman, I. and Ramanathan V. (2014), "Observational determination of albedo decrease caused by vanishing Arctic sea ice," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 111, pp.3322-3326.
- Rigaud, K. K., de Sherbinin, A., Jones, B., Bergmann, J., Clement, V., Ober, K., Schewe, J., Adamo, S., McCusker, B., Heuser, S. and Midgley, A. (2018), "Groundswell : Preparing for Internal Climate Migration." World Bank, Washington, DC. Available at: <https://openknowledge.worldbank.org/handle/10986/29461> (accessed 24 March 2018).
- Rogers et. al. (2017), "Fisheries productivity under progressive coral reef degradation", *Journal of Applied Ecology*, 10.1111/1365-2664.13051

- Ruppel, C. D. and Kessler, J. D. (2017), "The interaction of climate change and methane hydrates," *Review of Geophysics*, Volume 55, Issue 1, pp.126-168. Available at: <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2016RG000534> (accessed 24 March 2018)
- Saunio et al (2016), "The global methane budget 2000–2012," *Earth System Scientific Data*, vol. 8, pp.697–751. Available at: www.earth-syst-sci-data.net/8/697/2016/ (accessed 24 March 2018).
- Schmidt, J. (2000), *Disciplined Minds - A Critical Look at Salaried Professionals and the Soul-Battering System that Shapes their Lives*, Rowman & Littlefield, pp.293
- Schuur et. al. (2015), "Expert assessment of vulnerability of permafrost carbon to climate change", *Climatic Change*, Volume 119, Issue 2, pp.359–374
- Servigne, P. and R. Stevens (2020) *How Everything Can Collapse*, Polity Press, UK.
- Shakhova et. al. (2010), "Extensive Methane Venting to the Atmosphere from Sediments of the East Siberian Arctic Shelf", *Science, New Series*, Vol. 327, No. 5970 (Mar. 5, 2010), pp.1246-1250
- Singh, H., Harmeling, S. and Rai, S. C. (2016), "Global Goal on Adaptation: From Concept to Practice." A report written on behalf of CARE International, ActionAid, and WWF. Available at: <http://careclimatechange.org/wp-content/uploads/2016/11/Global-Goal-on-Adaptation-From-Concept-to-Practice-v2-DesktopPrint-NoCrops.pdf> (accessed 24 March 2018).
- Spratt, D., & Dunlop, I. (2018) "What lies beneath: The Understatement Of Existential Climate Risk" National Centre for Climate Restoration. Available from <https://www.breakthroughonline.org.au> (Accessed Jan 1 2019)
- Steffen, A. (2017), Tweet on 10 July. Available at: <https://twitter.com/AlexSteffen/status/884262230279176193> (accessed 24 March 2018).
- Stockholm Resilience Centre (2015) "What is Resilience?". Available at: www.stockholmresilience.org/research/research-news/2015-02-19-what-is-resilience.html (accessed 24 March 2018).
- Stokes, B. (2017), "Global Publics More Upbeat About the Economy, But many are pessimistic about children's future," *Pew Global*, 5 June. Available at: www.pewglobal.org/2017/06/05/global-publics-more-upbeat-about-the-economy/ (accessed 24 March 2018).
- Temby, O., J. Sandall, R. Cooksey, G. M. Hickey (2016) Examining the Role of Trust and Informal Communication on Mutual Learning in Government, The Case of Climate Change Policy in New York, *Organization & Environment*, vol. 30, 1: pp. 71-97.
- The Arctic* (2017), "Underwater permafrost on the Arctic shelf melting faster than expected," 9 August. Available at: <https://arctic.ru/climate/20170809/655109.html> (accessed 24 March 2018).
- The Conversation* (2017), "Fossil Fuel Emissions Hit Record High After Unexpected Growth – Global Carbon Budget 2017," 13 November. Available at: <https://theconversation.com/fossil-fuel-emissions-hit-record-high-after-unexpected-growth-global-carbon-budget-2017-87248> (accessed 24 March 2018).
- Thurber, A. R., S. Seabrook and R. M. Welsh (2020) Riddles in the cold: Antarctic endemism and microbial succession impact methane cycling in the Southern Ocean, *Proc. R. Soc. B* 287. <http://dx.doi.org/10.1098/rspb.2020.113>

Wadhams, P. (2016) *A Farewell to Ice*, Oxford University Press, Oxford.

Wadhams, P. (2018), "Saving the world with carbon dioxide removal," *Washington Post*, 8 January. Available at: https://www.washingtonpost.com/news/theworldpost/wp/2018/01/08/carbon-emissions/?utm_term=.308256f2236c (accessed 24 March 2018).

Wallace-Wells, D. (2017), "The Uninhabitable Earth: Famine, economic collapse, a sun that cooks us: What climate change could wreak — sooner than you think," *New York Magazine*, 9 July. <http://nymag.com/daily/intelligencer/2017/07/climate-change-earth-too-hot-for-humans.html> (accessed 24 March 2018).

Warren, R., Price, J., VanDerWal, J., Cornelius, S., Sohl, H. (2018), "The implications of the United Nations Paris Agreement on Climate Change for Globally Significant Biodiversity Areas", *Climatic Change*, 2018.

Watts, J. (2018), "Arctic warming: scientists alarmed by 'crazy' temperature rises," *The Guardian*, 27 February. Available at: <https://www.theguardian.com/environment/2018/feb/27/arctic-warming-scientists-alarmed-by-crazy-temperature-rises> (accessed 24 March 2018).

Wiebe et. al. (2015), "Climate change impacts on agriculture in 2050 under a range of plausible socioeconomic and emissions scenarios", *Environmental Research Letters*, Volume 10, Number 8.

Williams, T. (2018), "Adapt or Die: How Climate Funders Are Falling Short on a Key Challenge," *Insidephilanthropy.com*, 15 February. Available at: <https://www.insidephilanthropy.com/home/2018/2/15/climate-adaptation-field-faces-large-gap-in-action-and-funding> (accessed 24 March 2018).

Woosley, R.J., Millero, F.J. and Wanninkhof, R. (2016), "Rapid anthropogenic changes in CO₂ and pH in the Atlantic Ocean: 2003–2014," *Global Biogeochemical Studies*, vol.30, issue 1, pp.70-90. Available at: <https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1002/2015GB005248> (accessed 24 March 2018).

World Values Survey (2016), "Findings and Insights." Available at: <http://www.worldvaluessurvey.org/WVSContents.jsp> (accessed 24 March 2018).

World Wildlife Foundation (2018) "Half of plant and animal species at risk from climate change in world's most important natural places" Available at: http://wwf.panda.org/wwf_news/?324471/Half-of-plant-and-animal-species-at-risk-from-climate-change-in-worlds-most-important-natural-places (accessed Dec 12 2018) Whyte, K.P., Talley, J. and Gibson, J. (2019) Indigenous Mobility Traditions, Colonialism and the Anthropocene, *Mobilities*, 14 (3): 319-335.

Xu, Y. and V Ramanathan (2017) Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes, *Proceedings of the National Academy of Sciences* 114(39) DOI: 10.1073/pnas.1618481114

Xu, Y, V. Ramanathan and D. G. Victor (2018) Global warming will happen faster than we think, in *Nature*, <https://www.nature.com/articles/d41586-018-07586-5>

Zhang et. al. (2016), "Economic impacts of climate change on agriculture: The importance of additional climatic variables other than temperature and precipitation", *Journal of Environmental Economics and Management*, Volume 83, pp.8-31.

Letter to the Editor of SAMPJ, Professor Carol Adams, from Professor Jem Bendell, 27th July 2018.

Dear Professor Adams,

It is an odd situation to be in as a writer, but I feel compassion for anyone reading my Deep Adaptation article on the inevitability of near-term social collapse due to climate chaos! I am especially grateful for anyone taking the time to analyse it in depth and provide feedback. So, I am grateful to you arranging that and the reviewers for providing their feedback. Some of the feedback, particularly recommendations for a better introduction, were helpful. However, I am unable to work with their main requests for revisions, as they are, I believe, either impossible or inappropriate, as I will seek to explain.

I agree with Professor Rob Gray that “The journal's constant exploration of new and challenging perspectives on how accountability and sustainability might play out in organisations ensures a stimulating source of articles, experiences and ideas.” It is why I was pleased to guest edit an issue last year and bring critical perspectives on leadership to its readership. However, the topic of inevitable collapse from climate change is so challenging it is not surprising it didn't find support from the anonymous peer reviewers.

I would have had difficulty finding motivation for undertaking a complete re-write given the conclusion of the paper – that the premise of the “sustainable business” field that the journal is part of is no longer valid. Indeed, the assumptions about progress and stability that lead us to stay in academia in the field of management studies are also now under question.

The first referee questioned “to which literature(s) does this article actually contribute” and stated that “the research question or gap that you intend to address must be drawn from the literature,” continuing that “to join the conversation, you need to be aware of the current conversation in the field, which can be identified by reviewing relevant and recent articles published in these journals.” That is the standard guidance I use with my students and it was both amusing and annoying to read that feedback after having dozens of peer-reviewed articles published over the last 20 years. The problem with that guidance is when the article is challenging the basis of the field and where there are not any other articles exploring or accepting the same premise. For instance, there are no articles in either SAMPJ or Organisation and Environment that explore implications for business practice or policy of a near-term inevitable collapse due to environmental catastrophe (including those that mention or address climate adaptation). That isn't surprising, because the data hasn't been so conclusive on that until the last couple of years.

It is surprising therefore that the first reviewer says “the paper does not contain any new or significant information. The paper reiterates what has already been told by many studies.” The reviewer implies therefore that the paper is about climate change being a big problem. But the article doesn't say that. It says that we face an unsolvable predicament and great tragedy. When the reviewer says “There are not clear contributions that can be derived from the article” then I wonder whether that is wilful blindness, as the article is saying that the basis of the field is now untenable.

At a couple of points, I attempted to cut through the unemotional way that research is presented. For instance, when I directly address the reader about the implications of the analysis for their own likely hunger and safety, it is to elicit an emotional response. I say in the text why I express myself in that way and that although it is not typical in some journals the situation we face suggests to me that we do try to communicate emotively. The reviewer comments “the language used is not appropriate for a scholarly article.”

The second reviewer summarises the paper as “the introduction of deep adaptation as an effective response to climate change” which suggests to me a fundamental misunderstanding despite it being made clear throughout the paper. There is no “effective” response. The reviewer also writes “I am not sure that the extensive presentation of climate data supports the core argument of the paper in a meaningful way.” Yet the summary of science is the core of the paper as everything then flows from the conclusion of that analysis. Note that the science I summarise is about what is happening right now, rather than models or theories of complex adaptive systems which the reviewer would have preferred.

One piece of feedback from the 2nd reviewer is worth quoting verbatim:

“The authors stress repeatedly that “climate-induced societal collapse is now inevitable” as if that was a factual statement... I was left wondering about the social implications of presenting a scenario for the future as inevitable reality, and about the responsibility of research in communicating climate change scenarios and strategies for adaptation. As the authors pointed out, denial is a common emotional response to situations that are perceived as threatening and inescapable, leading to a sense of helplessness, inadequacy, and hopelessness and ultimately disengagement from the issue...”

This perspective is one I discuss in some detail in the paper, as one that enables denial. It reflects the self-defeating hierarchical attitude towards society that many of us have in both academia and sustainability, where we censure our own exploration of a topic due to what we consider should or should not be communicated. There is both scholarship and experience on the impact of communicating about disaster, and I discuss that in the paper.

The trauma from assessing our situation with climate change has led me to become aware of and drop some of my past preoccupations and tactics. I realise it is time to fully accept my truth as I see it, even if partially formed and not polished yet for wider articulation. I know that academia involves as much a process of wrapping up truth as unfolding it. We wrap truth in disciplines, discrete methodologies, away from the body, away from intuition, away from the collective, away from the everyday. So as that is my truth then I wish to act on it as well, and not keep this analysis hidden in the pursuit of academic respect. Instead, I want to share it now as a tool for shifting the quality of conversations that I need to have. Therefore, I have decided to publish it simply as an IFLAS Occasional Paper.

The process has helped me realise that I need to relinquish activities that I no longer have passion for, in what I am experiencing as a dramatically new context. Therefore, I must step back from the Editorial team of the journal. Thank you for having involved me and congratulations on it now being in the top ten journals in business, management and accounting.

Please pass on my thanks to the reviewers. On my website www.jembendell.com I will be listing some links to articles, podcasts, videos and social networks that are helping people explore and come to terms with a realisation of near-term collapse (and even extinction), which they may be interested in.

Yours sincerely,

Jem Bendell