FOUNDATION FOR DEMOCRACY AND SUSTAINABLE DEVELOPMENT

The Future of Democracy in the Face of Climate Change

Paper Five

How might democracy and participatory decision-making have evolved to cope with the challenges of climate change by the years 2050 and 2100?

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"[D]emocracy is not a static paradise, achieved once and for ever, but rather a never-ending social process. It needs permanent rethinking, commitment and active involvement from all citizens to safeguard its virtues."
Bernd Hamm[1]

"Whatever form it takes, the democracy of our successors will not and cannot be the democracy of our predecessors."
Robert Dahl[2]

"[I]f we start at the level of emissions expected from the Copenhagen Accord pledges in 2020 and then follow the range of these pathways through to 2100, we find that they imply a temperature increase of between 2.5 to 5°C before the end of the century... The lower bound is the case in which emissions are fairly stringently controlled after 2020, and the upper in which they are more weakly controlled. In other words, emission levels in 2020 implied by current pledges do not seem to be consistent with 2°C or 1.5°C temperature limits. To stay within these limits, emission levels would have to be lower in 2020 and then be followed by considerable reductions."
UNEP[3]

"If global warming is to be limited to a maximum of 2°C above preindustrial values, global emissions need to peak between 2015 and 2020 and then decline rapidly. To stabilize climate, a decarbonized society – with near-zero emissions of CO_2 *and other long-lived greenhouse gases – needs to be reached well within this century. More specifically, the average annual per-capita emissions will have to shrink to well under 1 metric ton* CO_2 *by 2050. This is 80-95% below the per-capita emissions in developed countries in 2000."*
Copenhagen Diagnosis, 2009[4]

"Over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel".
Millennium Ecosystem Assessment, 2005[5]

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About the author and acknowledgements

Halina Ward is Director of the Foundation for Democracy and Sustainable Development (FDSD: www.fdsd.org). FDSD is a charity which works to identify ideas and innovative practices that can equip democracy to deliver sustainable development.

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Any mistakes or omissions are mine.

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Foreword

Professor Tim O'Riordan

Climate change challenges democracy. But climate change also needs democracy. Halina Ward and her colleagues have created a wonderful text to show us why this is the case; the most comprehensive assessment of this relationship ever penned.

We live in a carbon dependent world. And for the most part, we are loath to forego this somewhat cosy arrangement. Carbon dependency is promoted in part by technology which gives us many good things on the cheap: electricity, personal mobility, affordable consumer goods, cooling and warmth. It is also encouraged by governments which promise easy options to low carbon outcomes, without delivering these options. And for the most part, we do not seem to care, as the goodies continue to arrive.

We all know in our hearts that this is a copout: we are duped but we connive in the deceit. And democracy is not a system that forces us to face up to these contradictions. We want to live in a sustainable society but the political system does not reward or support the innovators and entrepreneurs who would guide us to it.

Political institutions manipulate us, as do the power brokers who shape political opinion and guide policy. The size of the climate challenge threatens to overwhelm a democratic system that biases towards the *status quo*.

Democracy shuns the long term. This is especially the case when the costs of present action fall on us, the existing voters, whereas the benefits accrue to an unknown future tribe. This tribe may be our grandchildren, but we hope (and easily forget) they will not need our largesse. The apparent sacrifice is felt all the more acutely in a time of austerity. Household incomes are falling and day to day costs are rising. Moreover today, the formerly contented European middle classes, sitting in the gap between the rich minority and the poor majority, for the first time in living memory cannot be sure their children will be better off than they are. Confronted by this austere prospect, this group - the natural allies of climate stability – become unsettled.

Halina and her colleagues seek a way forward; assessing the consequences for democracy associated with trying to create the appropriate political, social and economic conditions aimed at meeting different emissions reduction pathways.

Assessing the implications of climate change for democracy to 2050 – and beyond, to 2100 – is both a challenging exercise and a valuable one. The stories that are set out in the final section of this report represent the outcome of a joyous juggling act. The outcomes reflect almost unimaginable combinations of options. The balls in the air are incentives, regulations, communications, moral norms, social interactions, technological treasure troves, and the great unknown unknowns.

What is profound though is the scope for enlightenment. Look carefully at *Figures 3, 4* and *5*. They chart the possible consequences for democracy all over the world of three scenarios: 'transition democracy' to something akin to sustainability; 'post authoritarian democracy' to a more enlightened world in the wake of failed attempts at coercion; and a 'technocratic democracy' based on authoritative hierarchism and commissions of experts. A fourth scenario; 'rationed democracy';

takes the form of a speech delivered from the year 2050 by Minister for Future Generations Septima Tulisa. It is a warning from a society that has failed to take effective climate action in time; a society in which democracy itself is 'rationed' but in which, nonetheless, there are signs of hope. All of these scenarios are plausible. All are worked through with creative imagination.

This is a report that gives us hope and a basis for setting out our new democratic stalls. We offer Halina and her colleagues our heartfelt thanks.

Norwich, January 2012

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1. Introduction

What has gone before

This is the fifth and final paper in FDSD's project on *The future of democracy in the face of climate change*.

In *Paper One*, we highlighted a broad range of relationships between climate change and democracy. *Paper Two* highlighted a range of ways to look at the idea of 'democracy' and its content, the ways in which it has been measured, as well as some of the body of thinking about how democracy has evolved and been seeded in various parts of the world.

Paper Three analysed a relatively modest existing body of analysis on 'the future of democracy', and in the process also helped to identify some variables in possible futures for democracy *before* climate change is factored in. *Paper Three* also pointed to some of the external contextual factors that could help to determine the relationship between democracy and action to address climate change; including evolving ideas about sustainable development, the changing shape of global governance, and overall thinking on geopolitical change. And it identified a range of important points of intersection in a wide range of literature and investigation of human endeavour; areas where developments over the coming years could themselves have a significant impact on the 'fit' between democracy and climate change mitigation and adaptation.

In *Paper Four* we reviewed the current state of play in mainstream climate science – taking as a basis the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).

This final paper takes this earlier work as its starting point, and adds to it to provide a more complete basis for developing scenarios.[7]

There are many ways to tell stories about, or from, the future. Alvin Toffler's 1980 bestseller *The Third Wave* includes a letter to the Founding Fathers reflecting on the democratic challenges facing America. John Keane creates a muse speaking from the future. UK-based think tank New Economics Foundation communicated its scenarios on the future of climate change through a series of newspaper reports, and Richard Heinberg's 'letter from the future' in his book *Peak Everything* provided narrative for the film *Age of Stupid*.

Scenarios are simply stories about the future. They are not predictions, nor projections. At the same time, FDSD's concern to provide fuel for a process of transformational change in which democracy is actively and consciously equipped to address challenges such as those of climate change means that it is particularly important that our stories – our narratives of a positive future – are designed to inspire action in the present. They must provide part of the basis for practical action. And modelling new behaviours can also inspire others to action.

The scenarios that are set out in this paper are based on simple narratives. But as we refine and finalise the scenarios, we will think about how best to communicate them as stories, sources of inspiration, and pictures of possible futures.

Across *Papers One* to *Four*, it is clear that climate change has the potential to generate democracy challenges on (at least) three levels:

- Managing the *processes* that give rise to climate change and the policy processes for mitigating harmful climate change (for example, industrial processes that give rise to carbon emissions, or policy processes for setting legally binding frameworks for mitigating climate change). These challenges raise issues both at global and national/subnational levels.
- Managing the *impacts* of climate change including scarcity, migration and disaster.
- Managing the *geopolitical dimensions* of climate change: for example, those arising out of the opening up of the Arctic to year-round navigation.[8]

FDSD's work on the future of democracy in the face of climate change is grounded in two hypotheses:

- First, that ***climate change will impact on democracy***, when democracy is understood as a political system (see *Paper Two*). Democracy itself could even be threatened by climate disruption and related emergencies in some parts of the world if suitable mitigation and adaptation strategies are not adopted as soon as possible (as discussed later in this paper).

- Second, that ***the system of democracy applied within a nation or its regions affects climate change*** because the system of democracy is itself connected to the possibility of the emergence of effective responses to climate change. Without innovations and evolution in democratic governance, democracies will not find it easy or even possible to meet the particular challenges posed by climate change. By way of evidence, we might point to:

    - failure of the United States to muster support in Congress for the Kyoto Protocol or for meaningful action at the 2009 Copenhagen Climate Summit;
    - mobilisation of sceptics and 'deniers' against climate action, with support from major political parties and lobbies, for example in the USA, Canada and Australia; or
    - the fact that the UK's Climate Act with its legally binding targets remains unique in the world, and is under continual attack.

The thing about climate change

By way of reminder: anthropogenic climate change is closely linked to the greenhouse gas emissions that result from a wide range of human activities. The range of those activities is so broad that it has the potential to encompass almost every aspect of human life, from heating and lighting homes and businesses, to agriculture and other forms of land use, to travel and transport, and of course industrial production processes. The largest growth in global greenhouse gas emissions due to human activity in recent decades has been from energy supply, transport and industry.

One thing is agreed: CO_2 traps heat, and the burning of fossil fuels adds to CO_2 in the atmosphere. Equally, it is clear that the non-renewable nature of fossil fuels means that, as Roger Pielke Jr argues in his book *The Climate Fix*, *"accelerating decarbonisation of the global economy and improving adaptation to climate change make good sense quite independent of long-term predictions of the climate future"*.[9]

Immediately before the industrial revolution, CO_2 concentrations in the Earth's atmosphere were about 280 parts per million (ppm). By the end of 2009, concentrations of CO_2 in the Earth's atmosphere stood at 388ppm. They are currently rising at about 2ppm annually. According to

models used in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, *if* the world continues to rely on carbon-based energy, *if* population growth continues at its current rate, and *if* 'dirty' technologies continue to be used, average global temperatures may increase by as much as 6.4^{o}C by 2100 (the end point for our scenarios) or 6.9^{o}C relative to pre-industrial levels.

These kinds of increases in average global temperature could bring impacts that might *potentially*, according to some scientists, be associated with extinction of the human race. Clearly, in such a situation, scenarios for the future of *democracy as a political system* (as distinct from a system of social organising principles applied by a few survivors) would be meaningless to 2100.

Structure of this report

The remainder of this report begins in *Section 2* by recapping on four key problems in the relationship between democracy and climate change which were highlighted in *Papers One* to *Four* in this project. It goes on to make the case for democracy, and then explores in general terms how democracy might respond to climate change. The next subsection turns to some of the features of a notional 'good' democracy for climate change adaptation and mitigation, and 'good' climate outcomes.

Separate subsections consider what degree of change might be possible over the forty and ninety year time-horizon for our project: what might be the accelerators and the decelerators of change?; How should we view the 40 and 90-year time-spans for our work?; and reflect on the extent to which law, policy and institutions might be capable of driving the necessary changes. Finally, *Section 2* reflects on the idea of 'people' versus 'technology-centred' approaches to change.

Section 3 of the report describes the analytical approach that we have followed to develop the scenarios.

Section 4 describes thirty of the key 'drivers of change' in the external environment to 2050 and 2100. It highlights (where feasible and helpful) key uncertainties in the future trajectory of the driver under consideration and highlights its broad implications for democracy and climate change.

Section 5 introduces four scenarios for 2050, and four sketches for 2100.

Drawing on analysis in *Sections* 3 and *4*, the report concludes that there are two persistent sets of uncertainties that are related at the same time a) to our core research question *and* to climate change adaptation and mitigation, *and* b) to the possibility of democratic transformation across some of the key areas where there are dissonances between liberal democracy on the one hand, and effective mitigation of and adaptation to climate change on the other (highlighted further in *Section 2* below).

These persistent uncertainties are:

- The nature and availability of hard technology related to climate change adaptation and mitigation.
- The nature of the values expressed in societies through a variety of human activities including consumption, lifestyles and political preferences and behaviours.

These uncertainties form the basis for two 'axes' of change (*x* and y) from which we derive our scenarios. We explain our reasoning for this choice of axes further in *Section 3*.

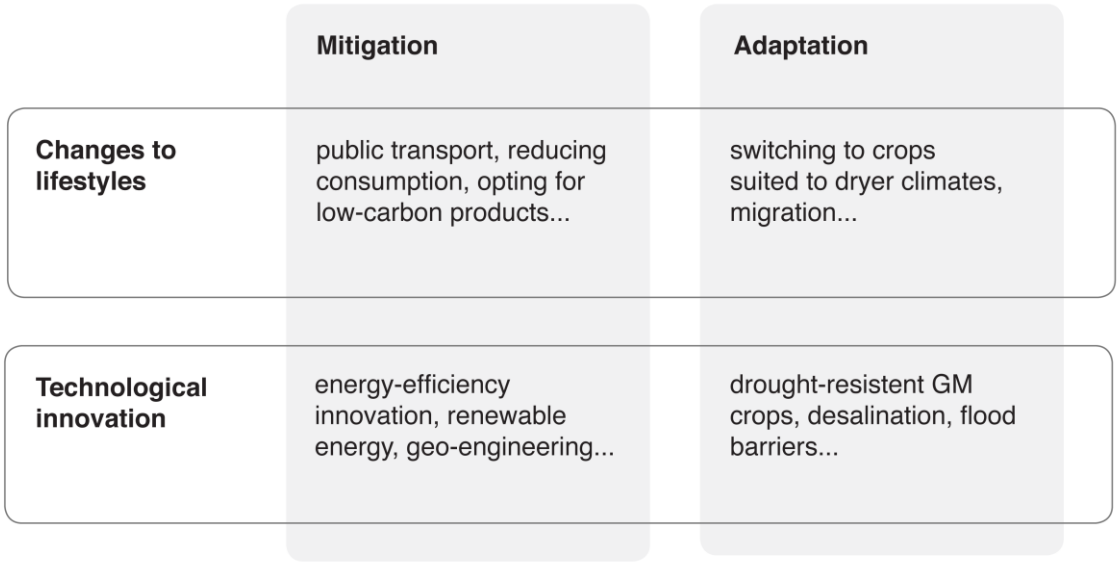
Figure 1 below describes some basic sets of relationships that are considered in the scenarios. There are broadly speaking two types of responses to the potential for harmful human-induced climate change:

- *Mitigation* (so that the likelihood of the climate changes arising in the first place is reduced)
- *Adaptation* (so that the capacity of people, communities, societies and ecosystems to adapt to the effects of climate change is enhanced)

In turn, both mitigation and adaptation responses to climate change can helpfully be divided into two categories (which can overlap to some degree):

- Those that involve changes in human lifestyles; whether to minimise emissions of greenhouse gases such as carbon or methane from human activity, or to create greater capacity to adapt to climate change
- Those that flow from technological innovation; for example to engineer or design energy efficiency improvements into buildings or (in the case of geoengineering) make use of technological intervention to interrupt or forestall processes of climatic change.

Figure 1: Mitigation, adaptation, lifestyles and technological innovation



Arguably, effective mitigation of climate change is more challenging for democracy than adaptation to the effects of climate change once they have begun to be felt. Crudely put, at a general level, effective action on climate mitigation within a democracy (at least at a point in time when climate impacts are likely to be distant in both time and space) is more demanding of peoples' altruism than an appeal to self-interest and community engagement in the face of clear and present dangers from climate impacts at the local level.

As this project has evolved, alongside the first two years of the Foundation for Democracy and Sustainable Development's work, we have recognised that one of the key obstacles to change is quite simply a belief that 'it can't be done, in the time and on the scale required'. Many of our stories therefore incorporate a bias: part of their purpose is to support a belief that change is possible; but that action is urgently needed.

We are less interested in 'collapse' scenarios as an invitation to conversation. One natural response to such scenarios, if they are credible, is to shrink back from a commitment to democracy, or to take refuge in stories of 'uncivilisation', as the Dark Mountain Project (highlighted in *Paper Three*) does. We are far more interested in building the circumstances for lasting change that allows effective adaptation to and mitigation of climate change, and the realisation of the potential of sustainable development as an overarching goal for human endeavour. This is why, even in our 'worst case' stories from the future, we seek to highlight the ways in which the embers of a future democracy might still be present.

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2. The challenges of democracy and the problem of time

Some problems with democracy

Around the world, people and communities face a choice: allow democracy to drift on the currents of environmental and social change, or equip it to chart a powerful course towards resilience, environmental protection and social justice.

There should be no debate about the desirability of democracy. Democracy is essential. But democrac*ies* are tricky.

Current systems of Western liberal democracy already struggle to cope with climate change or scarcity in natural resources. And climate change presents some quite specific problems for democracy, as *Paper One* in this project (*Democracy and climate change: why and what matters*) revealed.

At a highly aggregated level, there are four sets of problems or tensions in the relationship between liberal democracy and effective climate adaptation and mitigation.[10]

In the first place, short-term electoral cycles and snapshot opinion polls too often dictate political priorities. Yet long-term thinking is precisely what is required to ensure that actions are taken now to forestall the risk of possibly extreme climate change in the future, or to build societal resilience sufficient to ensure responses to climate change. The fact that climate change impacts are considerably dispersed in space and time can easily take the urgency out of effective action on either mitigation or adaptation at the same time as incentivising free-riding (or the belief that 'someone else will do it'). Furthermore, climate impacts extend well beyond the relatively short-term electoral timetables of democracies. Political parties proposing radical action now are easily outvoted by those proposing action later or not at all; and the reality of relatively short election cycles means that effective political action on climate change demands sustained cross-party consensus over many decades.

Closely related to the problem of short-termism, liberal democracy can struggle to take proper account of the interests of future generations and other 'non-voting' stakeholders. James Mill argued that representative democracy was the protector of private property and possessive individualism; that it confirmed to the incontrovertible Utilitarian principle that *"if the end of Government be to produce the greatest happiness of the greatest number, that end cannot be attained by making the greatest number slaves"*.[11] But Mill's individualistic version of liberal democracy is poorly suited to delivering the scale of collective endeavour that might be called for by severe climate change.

Many (even most) of the people who are likely to be affected by climate change do not have a vote in the spaces or in the moments when preventive action needs to be taken; because they are too young, or not yet born, or (because like residents in the small islands of the Pacific who face the complete annihilation of their home states with rising sea levels) they are too distant in space from the places where political will for effective action must be seeded.

At the same time, what is needed is much more than 'future generations' thinking. A deeper futures orientation is important if the needs of future generations are to be brought more closely into democracy. Mika Mannermaa (*Table 1* below) helpfully contrasts some of the characteristics of futures thinking with those of representative democracy.

Table 1: Futures thinking and representative democracy contrasted

Futures thinking	**Prevailing (representative) democracy**
Futures perspective: long term, decades or beyond	Futures perspective: short term, parliamentary cycle (often four years) or the budget year
Long-sighted approach – "sometimes you have to say 'no' today to have something better tomorrow"	Short-sighted approach – "rewards and gratification have to be immediate"
Multi-sectoral systems thinking	Sectoral "not my job" thinking
New mindsets (paradigms, ideologies) and ways of organising societal functions are generated in information society and its successors	Mindsets and ways of organising societal functions (party system, etc) date from agrarian and industrial society; no change
Ever more complicated (complex) society; difficult and challenging to fully grasp ideas	Simplification; temptation to sell citizens simple solutions, which "the nation" also expects
Change – accelerating change, emerging issues, unpredictable surprises	Status quo, clinging to positions achieved, predictable trends and lack of change
Time and form broken down in processes	Time and forms determined in processes
Visions; objective and the value debates that they spark off	Modern information society has covered old ideologies; new ones are not born
Proactive approach – "future there to be made"; futures analysis of change factors in operating environment and inspiring visions forma a basis for strategies for grasping the future	Reactive or passive approach – react at last minute or "future there to be drifted into", inadequate ideological or inspiring visions of the future (Salla, Finland, Europe, world)

Source: Mannermaa, 2007[12]

The first set of problems, then, concerns the short-termism of liberal democracy and the associated difficulty that it has in accounting for the interests and needs of people without a vote – particularly those who have yet to be born.

Politicians tend to prioritise economic growth over other societal goals that challenge self-interest or where progress is difficult to measure. It can be hard to imagine democracy without the promise of endless improvements in living standards, or even to imagine a form of democracy that has quality of life and sustainable development as its goals. This is a major challenge in liberal democracies where liberal democratic ideals are closely connected to economic liberalism. Currently, liberal (as well as illiberal) economies are overwhelmingly natural resource and carbon-intensive; leading both to natural resource scarcity and to greenhouse gas emissions. Given the possibility that technological innovation alone may fail to come up with effective responses to climate change, dramatic lifestyle changes may be required to mitigate and adapt to climate change. Political leaders want the technofixes that can continue to allow consumerism to flourish. Worse still, politicians are even recasting their role as *leaders*, becoming mere legislators or policy-making functionaries in a policy space made narrower by globalisation.

Participatory and democratic decision-making is more difficult – more labour-intensive – where science is uncertain, or where available scientific evidence challenges deeply held cultural values (such as those associated with Western-style consumerism). And the problem is made worse because, as John Keane points out, democracies are plagued, in their actually-existing forms, by stagnation and complacency. Public support can be hard to win when it comes to action to address long-term societal shifts such as an ageing population, or dependence on fossil fuels, or challenges such as climate change where there is considerable scientific uncertainty and nearly everyone is part of 'the problem'.

This is the third problem: the problem of retaining and nurturing an active commitment to vibrant democracy whilst allowing expertise, and science, space to offer insights and inform policy.

There is also the problem of global governance: how to bring a concern for the Global South within decision-making in the democracies of the rich North? The writer Colin Crouch sees democracy being hollowed out by mass affluence and consumerism, and by globalisation, which has reduced national political capacity and the will to go against the grain of international market forces. Globalisation can also make national politics less significant, narrowing the effective range of policy options and identities offered by the main parties at the same time as offering a fig-leaf for weak political leadership and fostering path-dependency. There is a link here to John Keane's work on 'monitory democracy', explored in *Papers Two* and *Three*. He argues that this is the model in which we currently find ourselves, whichever democracy we might happen to live in: one with plenty of 'monitoring' and feedback loops, but coupled with a high degree of populism and cynicism.

The quality of the response to the challenge of climate change should reflect 'sustainable development'; a concept and goal which we explored in some detail in *Paper Three*. Democracy is to some extent already built into sustainable development. But sustainable development provides only very partial guidance on the substantive content of that 'democracy'. Equally, the IPCC makes no assumptions about the forms of political system that might deliver responses to climate change: it simply refers to adaptation and mitigation.

This insight leads to a further major challenge facing democracy when it is considered in the context of sustainable development: the challenge of *scale*. Climate change demands a globally coordinated response. But with painfully slow progress in intergovernmentally coordinated negotiations over climate change, emphasis has shifted to nationally and subnationally coordinated innovation to deliver climate solutions. At the same time, neither the idea of democracy nor the goal of sustainable development has been able to articulate a seamless vision of national or even local level *government*, much less the role of national level *leadership* in climate action. Local level action without clearly defined mechanisms for managing trade-offs between localities does little to assure integrated approaches to environmental, social and economic considerations.

Equally, local *or* national level action without a sense of broader temporal and spatial connection to climate-impacted communities and individuals is unlikely to deliver change on the scale that is required. 'Thinking globally acting locally' is here, as elsewhere, a powerful slogan. But there must at the very least be doubt that a myriad of locally coordinated actions can effectively respond to the earth systems whole. Scientific expertise certainly has a role to play in joining the dots. But so do all of the formal and informal spaces – including intergovernmental institutions – where people have opportunities to learn how best to base action on supranational understanding.

This is the fourth problem: the problem of *scale*; though it is a problem that stems as much from the idea of sustainable development as from any feature of democracy itself.

None of these challenges are inherently limited to democracies as distinct from more autocratic political systems; but they acquire a particular quality when they play out in democratic settings. True, even autocratic leaders need to consider the needs of people who live in their territories (even if only, in the case of truly despotic rulers, to ensure that they are able to continue to rule). But in a relatively stable autocratic setting, a long-term perspective on the part of the ruler, or policy approaches that hold back economic growth, or that keeps scientific evidence and any discussion of it away from the people, are all inherently less liable to face public opposition in the day to day course of events.

This is very far from an argument that autocracy is *better* positioned to tackle climate change than democracy. Democracy or some further evolved form of democracy is overall likely to provide a far better political system for tackling climate change than autocracy (whatever its form), as we argue further below. And democracy is also very certainly more closely linked to the idea of sustainable development than autocracy, for access to information and public participation in decision-making are among the most well-established and closely guarded principles of sustainable development.

Some political challenges associated with climate change will exist *whatever* the political system in play:

- The legitimacy of elites depends on economic growth being achieved and living standards secured, and climate action can be portrayed as a threat to growth.
- Fossil fuel-based lobbies are powerful interest groups in preventing action and in muddying debates.
- The sunk costs in carbon-intensive industries and infrastructures are very considerable.
- The free rider problem: the fear that others will not join in the costs of taking action, but will share the benefits.

More autocratic political systems will not be better than democracies at climate action, but they could give the impression that they are – for example because some might have capacity quickly to build energy infrastructure without being slowed down by democratic due process. An anti-democratic streak in parts of the environmentalist movement implies a rejection of sustainable development. Equally, environmentalists, or even people concerned about climate change, are frequently referred to in the western blogosphere as *green Nazis* or *eco-fascists*. Public confidence in climate science has waned. And as the stakes get higher in economic and lifestyle (not to mention political) terms, because these implications of both climate action and climate inaction are becoming clearer, the use of shocking media tactics is increasing all round. There is a great deal that the IPCC could do to offer greater clarity in the process. But what emerges next will depend as much on how democracy – understood both as a political system and as a social system – evolves.

So climate change impacts on democracy. And as any review of the available climate change mitigation and adaptation options makes clear, shifts in the practice of democracy could exert major impacts on climate change over the medium to long term.

The case for democracy

Given its very substantial flaws, what is the case for democracy?

There need be no apology for borrowing Winston Churchill's much-quoted insight:

> *"It has been said that democracy is the worst form of government except all the others that have been tried".*[13]

Democracy breeds possibility: *"people's horizons of what is thinkable and doable are stretched, and it is for that reason exciting, infuriating, punctuated by difficult, quarrelsome, ugly and beautiful moments. It makes good things possible – though it is not a good in itself"*; and *"democracy recognises that although people are not angels or gods or goddesses, they are at least good enough to prevent some humans from thinking they are angels or gods or goddesses."*[14]

Democracy is the best clumsy political system so far devised to enable humans to make well informed and accountable decisions, and to arrive at accommodations among competing values and ideas. It is the best available form of government.

The Nobel prize-winning economist Amartya Sen argues in *Development as Freedom*, that democracy, whilst not necessarily a prerequisite for progressive development, makes development more likely than does an authoritarian regime.[15]

But development is not the same as economic growth: David Keane notes that *"only one thing is certain: the findings [do] not confirm the commonplace that democracies are friends of economic growth – even supposing that quantitative economic growth is a desirable good*".[16] There is no consistent evidence, he argues, that democracies consistently outperform dictatorships in achieving economic growth.

The case for democracy is strong on other grounds though. There is a moral imperative to strengthen democracy to tackle climate change: evidence to date indicates that it is the more vulnerable and least politically powerful who are likely to be most negatively affected by climate change. And flawed as existing democracies might be, there is no alternative system currently in play, since the collapse of Communism in the Eastern Bloc, that shows effective potential to enfranchise the weakest people in any given society. For David Keane, this leads to the cardinal democratic virtue of *humility*.[17]

Democracy from its birth, Keane argues, *"took the side of people everywhere in their efforts to live as equals, to resist the arrogance of power camouflaged in grand Universal Principles and piffling prejudices"*.[18] He refers to the *"yearning of the democratic ideal to protect the weak and to empower people everywhere, so that they can get on with living their diverse lives on earth freed from the pride and prejudice of moguls and magnates, tyrants and tycoons"*.[19] If democracy were about humility, then *"whatever unity the polity enjoys is permanently questionable and constantly up for grabs, simply because the exercise of power over others is always scrutinised, contested, divided, constrained"*.[20] Democracies, he argues, dispense with the fetish of leaders.

At the same time, the democratic ideal that all people are equal has some troubling implications for a world adversely affected by resource scarcity and climate change. As Keane puts it, *"the ability of*

citizens equally to grasp the world around them depends crucially on their access to adequate resources".[21]

From an environmental perspective, whilst many democracies are also amongst the most polluting, democracy *"provides the best conduit to environmental quality, relative to other government structures."*[22] Citizens in democracies enjoy freedoms which allow them to express their concerns over environmental protection or degradation, and to influence political processes.[23]

Democracy is also strongly associated with the core principles of sustainable development, as we saw in *Paper Three* (though an argument that democracy is 'good' because it allows public participation is somewhat circular).

At the same time, democracy is associated with 'good governance' more generally in ways that authoritarianism never could be. In the Soviet Union, laws and regulations were Potemkin-like; facades erected on a crumbling edifice, fulfilling the social functions associated with keeping a naked emperor apparently clothed (if the imperial metaphor can be forgiven). Democracy offers a system of feedbacks far more effective than other systems fatally flawed by self-deception. It bears a legitimacy that other systems cannot (currently) compete with.

The challenge is to find ways to live up to the many virtues of democracy. For its effectiveness is diminished by its flaws. There is a certain path dependency to democracy, in which we keep doing what we have always done because we have always done it. Democracy is currently at risk of sclerosis. But we too often forget how young democracy is, and that there is, and there must be, a vast amount of innovation still to come. What *has been*, historically, is not a good guide to what *could be* in the future. Innovation in democratic practice can enable democracy to overcome some of the challenges. And it ought to be possible too: as we saw in *Paper Two*, liberal democracy has evolved rapidly over even the past fifty years.

There is no shortage of ideas to build on, as we saw in *Papers Two* and *Three*. We briefly consider below how and why some of these ideas might be capable of delivering change in behaviour, and therefore in systems of democracy.

How might Democracy respond to climate change?

Democracy and crisis

Leaving aside the uncertainties of climate science, what is the range of possible responses of democracy as a political system *if* the impacts of climate change were to be severe or catastrophic? This of course is the core question for this project; but before considering closely the drivers of impact on democracy and their possible relationship with climate change (in *Section Three*) it is worth pausing to consider *generally* what might be the triggers for widespread outbreak; or shutdown; in democracy? How do those triggers relate to the things that could unfold in the event of climate catastrophe, or a more gentle process of change?

We don't yet know whether climate change-related crisis would cause a roll-back of democracy. Indeed, one of the thinly veiled assumptions in this entire project has been that it is worth investing to ensure that it does not. Not only because democracy is inherently a good thing – but also because we believe it is *possible* to ensure that climate change does not trigger a massive roll-back of democracy.

In contrast, some Western writers go so far as to *begin* with an assumption of impending societal (and hence democratic) collapse: David Shearman and Joseph Wayne Smith write for example that *"we feel there is some merit in the idea of a ruling elite class of philosopher kings"*[24] *"who will attempt to preserve remnants of our civilization when the great collapse comes"*.[25] And the Dark Mountain Project grounds its principles of 'Uncivilisation' in a story which begins: "*We believe we are entering an age of material decline, ecological collapse and social and political uncertainty, and that our cultural responses should reflect this, rather than denying it… We aim to question the stories that underpin our failing civilisation, to craft new ones for the age ahead and to reflect clearly and honestly on our place in the world. We call this process Uncivilisation*".[26]

Climate change is often referred to as a crisis. Two key sequential questions that arise then are: 'What does crisis do to democracy and politics?' and 'how could we build resilience?'.

Past evidence, from responses to 9/11 in the US to food riots in the global South, is that threats severe enough to generate societal crisis can give rise to measures that bypass normal democratic processes or erode civil liberties. Certainly, crises including threats of terrorism, protests and coups, wars and food riots have often led to restrictions on freedom of expression or free media (shown clearly as governments have struggled to exert control over social media).

In the face of crisis, governments are often guilty of downplaying the scale of disaster – as in the cases of the Soviet government's response to the Chernobyl nuclear power plant disaster or more recently the Japanese government's response to the Fukushima crisis following the 2011 major earthquake and tsunami.

Governments might, conceivably, be tempted to censor mainstream and social media in order to downplay the effects of extreme weather events or climate change-related natural disasters. On the other hand, the tendency for cover-up that exists in the case of disasters stemming from a man-made source (such as a nuclear power plant) may not exist in the same way when the most proximate triggers for disasters can readily be framed as lying with 'nature' rather than 'human engineering or ways of life'. There is little evidence, for example, of media censorship in the aftermath of the 2010 New Zealand earthquake or the many thousands of aftershocks that followed and continue to this day; though there is significant evidence of a roll-back in democracy more widely. As political scientist (and FDSD trustee) Bronwyn Hayward, a Christchurch resident, notes:

> *"In reality political speed comes at a steep democratic price. No one denies the urgent need to house people warmly and provide security as winter descends. However the drive for efficiency is used to justify a governance response of command and control. A new centralised planning authority (the Canterbury Earthquake Response Authority or CERA) was created to replace local elected authorities. Rather than reinvigorating our struggling council by investing in staff and advisors to lift the capacity of elected representatives, democracy*

> *was supplanted by professionals. In the process institutional memory was eroded and pre-existing lines of communication disrupted."*[27]

At the same time, it is helpful to make a distinction between temporary or short term authoritarian measures or technocratic governance in response to specific climate crisis events on the one hand, and developments that might, over the longer term, erode 'deep democracy' more generally.

Crisis can bring out both the best and the worst in people – often at the same time. When many of England's cities erupted into violence and looting over the summer of 2011, many people were deeply moved by a spontaneous outbreak of riot clean-up 'wombles'; men and women impelled by social media to take to the streets in the aftermath of the looting, armed with brushes and household gloves to clean up the mess and express a collective sense of outrage and community spirit.[28]

Perhaps there is, after all, something archetypal and enduring about the idea of democracy itself? When a group of 33 Chilean miners, who had been trapped underground for many weeks without knowing whether they would survive, emerged from their incarceration after more than two months in October 2010, their leader revealed that they had applied a system of democratic decision-making during their ordeal. *"You just have to speak the truth and believe in democracy,"* said foreman Luis Urzua: *"Everything was voted on. We were 33 men, so 16 plus one was a majority."*[29] At the same time, the opposite case has also been argued by George Kennan: *"I know of no evidence that 'democracy', or what we picture to ourselves under that word, is the natural state of most of mankind"*.[30]

In any event, it seems fair to suggest that the longer democracies delay in taking decisive action to mitigate the pressures, the less likely democracy will remain intact as pressures turn to crisis.

US political scientist Ed Weber's scenarios (outlined in *Paper Three)* are helpful in pointing to the core of the possible range of relationships between democracy and climate change based on the kind of climate change impacts that might lie in the future and the speed at which those impacts might unfold.

Weber develops four hypothetical scenarios based on the two axes 'severity of climate change effects' (catastrophic, and major or minor – though without specifying the nature of the effects), and 'speed of change' (fast or slow). The two 'minor' scenarios (fast climate change with minor severity of impacts, and slow climate change with minor severity of effects) are not analysed, on the basis that without at least major or catastrophic change, the problems of climate change are not big or important enough to warrant a governance response.

Assuming then that climate change *actually* has catastrophic or major effects, the features of the four scenarios, as set out in Weber's article, are set out in *Table 2*.

Table 2: The interaction of climate change and governance responses

	Fast Climate Change (i.e. over the next 5 to 20 years)	*Slow Climate Change (i.e. over the next 80 to 100 years)*
Catastrophic effects	**Authoritative Coercive governance responses** - Globally centralized planning and action - Command and control with heavy, frequent coercion and heavy restrictions on individual and local autonomy - authoritarian philosopher kings (highly educated elites) in charge, along with physical scientists and technocrats	**Constrained Environmental Democracy governance responses** - Globally centralized *coordination* - Increased central national control - Slow change makes possible education and creation of new sustainability ethic - Coercion and restrictions on individual and local autonomy only if problem worsens - Privileged role to philosopher kings, physical scientists and technocrats - long time horizon and societal resilience goal means authoritative leadership spread across groups and areas of expertise
Major effects	**Liberal Democracy** - Global role more limited, focuses on coordination and information - National role diminishes; develops broad framework and criteria for success - Regions/communities make more choices - Larger role for market incentives/mechanisms for adjusting and pricing risks - Involves broader cross-section of elites and experts	**Deliberative and Dispersed Democracy** -Global and national roles as cheerleaders and facilitators - Regions, communities, and individuals granted greater freedom of choice - shared national/local governance authority is key - larger role for market incentives/mechanisms for adjusting and pricing risks - Heavy focus on education, resilience, and creation of new sustainability ethic - Collaborative capacity builders in high demand

Source: Edward Weber, 2008.[31]

The assumed scenarios are necessarily thumbnail sketches. For example, the nature of possible 'catastrophic' or 'major' assumed effects is not spelled out in any detail (though some examples are considered in the latter half of the paper). That is a significant rider, for the effects could themselves incorporate a variety of social and economic impacts with a significant effect on the feasibility of different governance responses – particularly if climate effects gave rise to the prospect of significant social unrest or collapse in the rule of law.

At the same time, it is entirely feasible that precautionary governance action could generate impacts for governance responses *irrespective* of the environmental effects of climate change. For example, if fast climate change with severe effects is credibly and authoritatively *predicted*, and those predictions generate public backing for meaningful action, climate change may tip political systems in a variety of directions based on precautionary action. Arguably, such a shift might be taken in and of itself to be a 'major' effect of climate change. The implications of the precautionary approach as a guide to governance responses, in other words, need to be fully factored in.

Professor Weber makes the suggestion that under the 'authoritarian coercive' response current systems of democratic governance are likely to be overwhelmed, and that in the 'constrained environmental democracy', "*democratic governance possibilities reappear*". In the 'liberal democracy scenario' of fast change and major effects, Weber suggests that *"highly educated elites and technical experts are still important… but given the non-catastrophic nature of climate change, they will tend to be subjected to the preferences of citizens as expressed through elected representatives".* [32] But even an authoritarian and coercive governance response could be associated with a transition process that carried the support of an alarmed *demos* – as happened, arguably, in the wake of the 9/11 attacks on the World Trade Centre in relation to certain civil liberties in the United States. Conceivably, a transition into and out of authoritarian governance modes might occur through the exercise of democracy.

Weber suggests that governance responses in different scenarios will be rational, for example in the suggestion that "*if climate change is perceived as slow and catastrophic, logic dictates that the locus of governance authority requires a significant centralized component*"[33] and justifies globally centralized coordination. But Shell's energy scenarios show how a scramble for access to energy might itself supplant such an assumption, displacing the long-term investment of globally centralized coordination with a retreat into resource nationalism.

Equally, in Weber's 'constrained environmental democracy' scenario, the extent to which the potential for catastrophic effects in the long-term drives governance responses will depend in part on the appetite of elected representatives and citizens to adopt the associated (long) time horizons in their decisions, and the availability of economic resources to sustain the generation of expert evidence over time.

Climate change and the 'goods' of democracy

Aside from crisis and societal breakdown and its possible effects on democracy, another entry point for purposes of considering the future evolution of democracy might be to consider the possible impact of climate change on those things that are commonly considered to be the 'goods' of democracy; or in a stronger form, those things that are considered *prerequisites* for democracy.

If climate change affects the variables that are commonly associated with democracy (including for example income equality and human development), what does that mean for the future of democracy in the face of climate change?

Most starkly, Przeworski *et al*, argue that *"once a country has a democratic regime, its level of economic development has a very strong effect on the probability that the democracy will survive"*.[34] They also argue that democracies are more likely to survive when they reduce income inequality. From this perspective, climate change could have a very significant impact on that possibility, to the extent that either: a) effective climate change mitigation or adaptation has the potential to impact negatively on levels of economic development, or b) climate disasters could arrest economic development (in the way, e.g. that the Japanese earthquake and tsunami did during 2011).

Another way to ground such an analysis is in the various available definitions of democracy; but this approach is likely to take us full circle to consider once more the impact of climate change on the *forms* of democracy around the world, and to consider how much erosion of democracy might be

feasible before we identify what is left as something *other* than democracy. For example, democracy is often definitionally associated with the ideas of respect for the rule of law; freedom of expression and the media; protection of citizens from state interference, and so on.

We have already considered in general terms, by means of proxies from other kinds of social crisis such as terrorism or food crisis, the extent to which climate crisis might erode for example freedom of expression or the protection of citizens from state interference. But what might be the impact of climate change on the socio-economic settings that make democracy *possible* in all its varied forms; or the circumstances that can be *correlated* with relatively strong or weak democracy?

Hernando de Soto argues (contentiously) that democracy is likely to be weak if *"the concept of ownership is unclear in a society or if the legal order is indeterminate"*. Equally, he suggests that *"when hunger persists, democracy makes hardly any progress for decades"*, and goes so far as to suggest that "*[i]t has been estimated that a prerequisite for the success of democracy is per capita GDP of at least $5000."*[35] Przeworski *et al* go much further with a number only slightly higher, arguing that "*Above $6000, democracies are impregnable and can be expected to live forever*".[36]

The impact of climate change on the concept of ownership is relatively uncertain, and relatively uncritical, we might argue. But the implications of climate change for hunger are far more significant; and the implications of climate change for economic growth and levels of GDP around the world are also likely to be significant. Might climate change keep *per capita* GDP in some parts of the world below USD $5000, thereby making democracy less likely to succeed?

It would be relatively easy to point to examples of circumstances where low *per capita* GDP is associated with lack of democracy, but the assertion that there is a USD 5000 threshold appears hard to back up empirically.

Clearly, climate change will have wide-ranging environmental impacts. But does a decline in environmental quality drag down democracy too? There is unsurprisingly little evidence that a healthy environment is in any sense a prerequisite for democracy. But environmental degradation and pollution has, in at least one major case, been a rallying cry for *pro*-democracy activists.

Matthews and Mock point to the role of the environmental movement in the collapse of the Soviet Union during 1989-90. With appalling environmental abuses a feature of Communist regimes of the Soviet Union and the Eastern bloc, *"[e]nvironment was a rallying cry of reform movements in the region, and stricter environmental legislation has been rapidly enacted under new democratic governments"*. Environmental degradation through climate change might, taking this example alone, become a rallying cry for greater democracy (possibly in the face of a rise in authoritarian measures in the event that environmental crisis turns to social crisis). However, environmental protection, at whatever level, needs to be understood as a feature of stable democracies, rather than an incremental trend linked to democratisation. In fact, processes of transition from autocracy to democracy present extremely vulnerable times for the environment, which "*may suffer worse damage than occurred under autocratic rule"*.[37]

Another suggestion that is often made is that the processes of *democratization* exert a moderating effect on income inequality. The evidence, however, is far from clear; with little empirical evidence of any consistent directional links between democracy and human development, and democracy and

income equality. David Keane concludes that there is no evidence for any consistent correlation between economic growth and democracy.[38] Any climate-induced impacts on development or on economic growth will not, therefore, generate predictable knock-on effects on democracy.

At the same time, even if it is not clearly correlated with democracy, *income equality* could be linked to the *capacity* of democracies to effectively to deal with climate change through mitigation and adaptation. Thus, for example, Richard Wilkinson and Kate Pickett's book *The Spirit Level: Why Equal Societies Almost Always Do Better* argues that *"the most important obstacle to achieving sustainability is consumerism and the opposition to any policy which appears to be an obstacle to the maximisation of personal incomes and consumption. A very important part of what fuels consumption however is status competition – keeping up with others, maintaining appearances, having the right clothes, car, housing education etc, to compare favourably with others. All these pressures are intensified by greater inequality".*[39] Income inequality may also be closely connected to the maintenance of the cultural pressures that are also reflected in short-termism within democracies, and in the bond between liberal democracy and economic liberalism.

Wilkinson and Pickett also link higher levels of income equality to higher levels of education and physical and mental health. *Paper Four* outlined a number of ways in which climate change could have potentially significant adverse impacts on physical and mental health. We might find that climate change amplifies some of the negative effects of income inequality in a toxic cocktail. But income *equality* (or a process of narrowing inequalities) is not a generalisable outcome of democracy.

Whether climate crisis triggers a widespread collapse in democracy or rather a global rise in collective action and a 'one world' spirit – or in what combinations these – will depend on a wide range of other factors. These will likely be as much cultural or spiritual as economic or political.

What would be 'good'?

One pathway to developing a *desirable* scenario for the future relationship between democracy and climate change is to start with a list of qualities that might be associated with outcomes that are both *good* for democracy and good for climate change mitigation and adaptation, in light of the three (or four) key sets of problems in the relationship between democracy and climate change highlighted above.

'Good' democracy

Drawing on Papers *One* to *Four*, together with stories developed during an event co-organised by the Foundation for Democracy and Sustainable Development, Salzburg Global Seminar and Schumacher College in April 2010,[40] a partial list of 'asks' for a 'good' democracy fit for the challenge of climate change, might include (but would not be limited to) the following:

- Less self-interest and a stronger sense of common interest: in civil society, in markets and in politics.
- Public policy processes, laws and institutions that are (regarded as) legitimate and fair.
- A shift in emphasis from a focus *on* the political space towards a much greater focus on communication and democratic exchange *in* the public space.

- More cooperation and less competition ('dialogue not dominance'): between people, communities, and organisations – with such competition as remains to spur innovation and creativity taking place on a level playing field and directed towards meeting human and societal needs.
- Fairness: equity, as between people alive today, and as between those alive today and those yet to be born.
- Democratic decision-making grounded less in politically determined boundaries and more in regions defined by the boundaries of ecosystems.
- A breakdown in unelected, unaccountable elites and the eradication of corruption.
- Markets working in service to climate mitigation and adaptation (in the interest of sustainable development and the long-term goal of sustainability), rather than elevated to the status of overarching goals of human endeavour.
- Greater regard for the interests and needs of future generations of people.
- Respect for the Earth's planetary boundaries and associated thresholds.
- Greater engagement and participation and less disengagement and alienation: at every level, from the local to the global, so that everyone would feel themselves an agent of change, not an unwilling servant of a political elite or of cliques, wherever they might be found.
- Greater public attention to quality of life and wellbeing rather than economic indicators of wealth, growth, or even poverty.
- A strong system of global governance for sustainable development, in which economic growth and development are harnessed to serve environmental and social justice.
- Leadership more closely tied to cultural space; and leadership in the political sphere is decoupled from the economic sphere.
- People have enough of everything to meet their needs as human beings.

So what would an ideal system of democracy be like in the here and now? And how might such an ideal system of democracy be linked to global governance? A non-exhaustive list of characteristics might include the following:

- It would be *inclusive* in a number of ways. In the first place, it would be capable of supporting the active involvement of all enfranchised people – whether directly or by means of meaningful systems of representation. And it would be capable of providing enfranchised people with the information needed to take account of the needs (and sometimes the interests too) of those who were not enfranchised; both in time and in space.
- It would provide for *accountability* of elected representatives on an ongoing basis.
- It would allow *strong leaders to emerge*; leaders with the space to inspire a belief in the possibility of change based on the equality of all people
- It would instil in people the sense of belonging needed to *follow* strong leaders without losing a sense of their own importance in the ongoing democratic process
- It would be *transparent*
- It would be associated with high levels of *participatory decision-making*
- It would allow more space for *deliberation* – and would provide the means for people to make time to engage in deliberative decision-making over difficult policy choices; doing so in ways that could match the pace of decision-making to the rate at which decisions need to be made and actions taken.

- It would be *long-termist*, providing the information, resources and wisdom for elected representatives to make decisions with regard to the long-term.
- It would foster high levels of community-based participation and engagement.
- It would provide for fair allocation of costs and benefits of action on climate change, from the local and up through the national to the global level.
- It would be associated with a high degree of *trust* in the institutions and processes of democracy and in elected representatives.

Is 'good' democracy different for adaptation and mitigation?

If these are some of the possible generic, and sketchy, characteristics of a 'good' democracy, derived from the specific challenges of the relationship between democracy and sustainable development, how might those characteristics differ between mitigation and adaptation?

At a general level, much of the political emphasis in the climate change agenda at global level until recently lay with efforts to *mitigate* climate change. More recently, however, there has been greater emphasis on *adaptation*.

For all that some approaches to climate adaptation are both technology-intensive and expensive, there is also considerable experimentation with approaches to adaptation that depend on community engagement and on the existence of strong local networks: in other words, some of the key characteristics of democracy applied at local level. After all, whether national governments with capacity to tackle climate change exist or not, people living closest to the impacts of climate change will have to do their best to find ways to adapt.

Taking work by researchers Yohe and Tol, there is a good deal of correlation between potential 'features of democracy/ democratic social organisation' on the one hand, and adaptive capacity on the other. In turn, adaptive capacity is closely linked to *resilience*, defined in WGII of the IPCC's Fourth Assessment report as: *"the ability of a social or ecological system to absorb disturbance while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt naturally to stress and change".*[41]

Box 1 highlights Yohe and Tol's determinants of adaptive capacity. And *Box 2* illustrates the range of those adaptation approaches that are not dependent on central government regulation or high levels of technological investment. In all of these approaches, strong social networks at community level provide a basis for a variety of adaptation strategies.

The 2010-11 World Resources Report, *Decision Making in a Changing Climate: Adaptation Challenges and Choices*[42], highlights five key elements in an architecture for significantly strengthening the ability of national governments to make effective adaptation decisions: public engagement, decision-relevant information, institutional design, tools for planning and policymaking, and resources. The report notes that: *"Engaging communities can build support for difficult adaptation choices as well as improve the quality of outcomes achieved. Public engagement throughout the entire policy process often is necessary to ensure the effectiveness and long-term viability of a policy or an activity. Civil society organizations can help facilitate this exchange between government and the public."*[43]

Box 1: Determinants of adaptive capacity

- The range of available technological options for adaptation
- The availability of resources and their distribution across the population (in part an outcome of the political system)
- The structure of critical institutions, the derivative allocation of decision-making authority, and the decision criteria that are employed
- The stock of human capital including education and personal security
- The stock of social capital including the definition of property rights
- "The system's access to risk spreading processes"
- The ability of decision-makers to manage information, the processes by which these decision-makers determine which information is credible, and the credibility of the decision-makers themselves
- The public's perceived attribution of the source of stress and the significance of exposure to its local manifestations

Source: Yohe and Tol, 2001[44]

Box 2: Low-tech adaptation responses to climate change

- Communities in Samoa in the South Pacific rely on informal non-monetary arrangements and social networks to cope with storm damage, along with livelihood diversification and financial remittances through extended family networks.
- Community organisation is an important factor in adaptive strategies to build resilience among hillside communities in Bolivia.
- Food-sharing expectations and networks in Nunavut, Canada, allow community members access to so-called country food at times when conditions make it unavailable to some.
- Namibia has created community-based institutions and local-level monitoring tools to better support farmers living in communal areas prone to land degradation.

Sources: IPCC 2007, WGII [45] World Resources Report 2010-2011[46]

Beyond general statements on the value of public engagement, however, indicators or determinants of *adaptive* capacity (to the extent that it might be possible to develop them) do not clearly relate to notional indicators of effective *mitigation* capacity. Mitigation capacity indicators, for example, might include clear and/or uncontested science, widespread public access to information (e.g. to maximise the potentially beneficial power of climate-sensitive consumer choice), strong public will for change (at least in democracies) and widespread and accessible alternative sources of energy.

Given the current low performance of most democracies across these potential determinants of mitigation capacity, *de facto* mitigation capacity might all too readily be associated with strong governance and top-down leadership.

In contrast, determinants of *adaptive* capacity developed in literature on climate change adaptation are overall more readily related to democracy and/or features of good governance for sustainable development.

It is clear too that there is no silver bullet when it comes to investment in the determinants of adaptive capacity. Rather, adaptive capacity and its close relative resilience are products of a shifting mix of societal climate change antibodies.

Authoritarian, centralised, top-down climate change adaptation could certainly happen. Think particularly about the maintenance of critical infrastructures for example, where there might be a tendency for central government to drive adaptative measures such as flood risk management over the wishes of local communities; as, for example, in the event that central government identifies a need to depopulate low-lying coastal areas. But much would depend on the availability of financial and technological resources and the capacity of national government (and its strength relative to sub-national government) at the points in space and in time when significant climate impacts are felt at community level.

Some of the tensions are explored in the report of the US Military Advisory Board, *National Security and the Threat of Climate Change*. As they note, the capacity for adaptation to climate change may be high in highly industrialised European states, but *"less so in lesser-developed places like the Balkans, Moldova, and the Caucasus... In northern Europe, countries may build higher dikes, as they have done in the past, but at a certain point that may not be sufficient, and much port and other coastal infrastructure would have to be moved further inland, at great expense."*[47]

The *potential* mismatch between what is needed of a democracy working for mitigation and what is needed for a democracy working for community-based adaptation to climate change, is potentially a key underlying theme for scenarios on the future of democracy in the face of climate change.

'Mitigation first' and 'adaptation first' approaches at different points in time, and in different geographical spaces, might offer significant contrasts from a democracy perspective. And with climate change already hard-wired into the Earth's systems, adaptation actions are justified independently of mitigation actions.

It is an open question whether efforts to strengthen democracy in various ways at sub-national levels (when democracy is understood as a political system) would deliver dividends in terms of enhanced adaptive capacity, and if so, where and how.

It seems intuitively unlikely (though not impossible in the setting of a long-term scenarios exercise) that local-level resilience to climate change could be delivered through authoritarian government. But history famously offers one example where governance responses to a crisis of resource scarcity not only reflected the adoption of a long time horizon – with responses spanning a period of more than one hundred years – but were also implemented in an authoritarian governance setting in which, nonetheless, the support and engagement of local communities was essential. The example concerns forest depletion in pre-industrial Japan.[48] As analyst Roman Krznaric concludes: "*..a conjunction of top-down and bottom-up policies, and producer responses to the changing timber marketplace, all set against a cultural background of respect for the well-being of future generations,*

helped to ensure that today's Japan is not the denuded lunar landscape it could so easily have become."[49] We return to this example later.

'Good' climate outcomes

So far, our proposed characteristics of a 'good' democracy focus principally on democracy, culture, and decision-making, rather than climate change outcomes. Climate change is at least an area where it is relatively easy to be confident about what is desirable:

- Global warming is limited to a global average of 2°C (ideally 1.5°C) over pre-industrial levels (an increase that could itself mean large species loss, more severe storms, sea level rise, floods and droughts[50]), and the associated negative climatic, social and environmental impacts of global warming are minimised.
- Overall concentrations of carbon dioxide stabilise at or below 350 parts per million. Global CO_2 emissions would need to reduce by 50-80% over 2000 levels by 2050, with emissions peaking by 2015 at the latest[51] in order to attain 350-400ppm

The current widely accepted notional target of 450ppm of carbon dioxide would likely be associated with an average 2°C warming worldwide. In practice, many policymakers see 550ppm as a more realistically achievable goal; one that could conceivably bring a global average temperature rise of 3°C by the end of the century compared to pre-industrial levels.[52]

Overall, an *ideal* set of climate change circumstances might be characterised as those associated, for the long-term, with the elimination of anthropogenic climate change. There are two ways in which that might be achieved:

- Through decision-making that results in global reduction of energy consumption that gives rise to greenhouse gas emissions, through changes in production and consumption patterns
- Through decision-making that leads to the development of technologies that effectively allow continued energy consumption, but eliminate the greenhouse gas emissions with which it is associated.

The first kind of decision-making calls for major changes in the lifestyles of very large numbers (a majority even) of people living in the world's richest countries, and for the suppression or transformation of lifestyle choices linked to increased energy consumption within poorer countries, including those with rapidly growing economies, such as that of China.

The second kind of decision-making calls for an overall policy environment that facilitates technological innovation and the unimpeded transfer of the technologies that can mitigate greenhouse gas emissions. This kind of decision-making is appealing because it might effectively neutralise the impact of climate change on democracy to some extent; but the evidence that it might transpire is currently far from convincing.

There is also the possibility (though it appears to be vanishingly slim) that only minimal policy or technology interventions might be required, because climate science, or the assumptions in which associated scenarios are grounded, turn out to be deeply flawed. In that case, the future course of

democracy will be influenced by climate change only to the extent that the discovery of those flaws has an impact on democracy.

Even an optimal system of democracy; one designed in such a way as to maximise the chances that anthropogenic climate change is mitigated, or that people everywhere have the best chances to adapt, may not lead to optimal policy decisions. There are choices to be made in areas where science is uncertain; there is always the possibility that a known, but remote, risk in fact materialises; there are unforeseeable twists and turns. There is no engineering out human error.

This very partial exploration of features of a society that is 'good for democracy, good for climate change mitigation and adaptation' leaves a great deal of scope for other areas of human endeavour to develop at their own pace. There is plenty of space left for playing, loving, learning, and enjoying being alive – but these activities are not central to the stories in our scenarios.

How long *is* ninety years?

How long is 40 years? How long is 90 years? How quickly could democracy be transformed, to the extent that there are mismatches between democracy and climate change?

In the fields of democracy and cultural transformation, 40 and 90 years appear to be short periods of time. On the one hand, that observation makes the nuts and bolts of a scenarios development exercise more feasible. If 100 years is a short time, it might be possible to come up with more credible stories. On the other hand, the scenarios and possible impacts emerging from the climate science would appear to demand radical and rapid change in political and (though it does not tackle these directly) economic systems.

At the same time, democracy futurists might have got it wrong when they imply that 100 years isn't very long: many of them fail to factor in natural resource challenges, let alone climate change, other than incidentally. If the scale and pace of change in the natural environment, and hence social organisation, are indeed set to be intense, we might be forced to accelerate our thinking on how, and why, to match our political systems to the new reality.

There are also some writers who take the pessimistic view; even to the extent, for example, that they suggest that change of certain kinds – cultural transformation in particular – is simply not possible[53] over anything other than a very long time horizon.

Whatever else, forty years (which will take us roughly to 2050) is a long time in terms of human lifespans: half a Western lifetime and nearly two generations. Ninety years – roughly the period left before we hit 2100 and the end point for the scenarios in this project – is even longer. But whether these are *actually* long periods of time is at very best debateable. And whether they are long enough to allow democracy to adapt to possibly catastrophic climate change; to survive and thrive; is a moot point, though one that we approach optimistically.

Even the idea that time runs consistently, in a straight line, or an even arc, or as a precisely determined 'tick-tock' across all fields of human endeavour is something that many disciplines and many human cultures would challenge.

C.S Lewis for example is credited with having said that *"the future is something which everyone reaches at the rate of 60 minutes an hour, whatever he does, whoever he is"*. But in *The Clock of the Long Now*, Stuart Brand explores what it might take to stretch the idea of 'now'; to make it a 'long now', so that what affects us directly, now, is expanded.[54] The trick, he says, is *"learning how to treat the last ten thousand years as if it were last week, and the next ten thousand as if it were next week"*.[55] Brand reminds readers of the difference between *kairos* and *chronos:* the former the time of opportunity and the propitious moment, and the latter eternal or ongoing time. For so long as culture, markets and technology are short-termist, chronos doesn't get much look-in in the political world. And Brand goes further, proposing six significant levels of pace and size in the working structure of a 'robust and adaptable' civilization. From fast to slow, he orders these fashion/art; commerce; infrastructure; governance; culture; and nature. Culture, he says, is where the Long Now operates.[56]

In her book about time, *Pip Pip*,[57] artist Jay Griffiths paints in words some of the multiple ways of viewing time across the world. She highlights 'womens' time' and the time of the Karen; or of the Navajo. She argues that human concepts of time are inherently ideological; often tied to human power rather than the power of nature; to straight lines rather than circles or loops or joyous curves.

It certainly seems at first blush that there is a mismatch between the idea of the 'available time' within which democracy will need to adapt and evolve in order to rise to the challenges of climate change (if we are to escape runaway climate change), and the paces at which democracy has evolved over the last two thousand years.

One challenge, if democracy is to remain resilient, and to rise to and tackle the implications of climate change whilst thriving and adapting; is to prove Stuart Brand wrong: to show that democracy, as a system of governance, is capable both of agility and fleetness of foot, and of leisurely contemplation. To *equip* it to be so.

A series of underlying assumptions related to these temporal mismatches may be among the most pernicious problems that stand in the way of meaningful change. If we are to take the idea of climate change seriously – if we are to behave in ways that are *precautionary* – we will need to take action with the faith that it is worth overcoming our underlying doubts about human beings' ability to match their actions and reactions to available timeframes.

At the same time, we may need to overcome our fear of Western, ordered, linear time. Members of the public faced with information about climate change and its impacts are often warned that there is only a very short period of time within which to act, even though that sense of urgency is entirely at odds with the way in which our political leaders appear to be tackling the issue. Partners in the UK-based '100 months' initiative play on that fear. They align themselves with a website which warns (to the sound of a ticking countdown currently at 60 months) that *"we have 100 months to save our climate. When the clock stops ticking, we could be beyond our climate's tipping point, the point of no return".*[58]

What then could be the triggers for time itself to loop into different forms; what are the accelerators of time and the braking forces when it comes to the relationship between democracy and climate change? What 'trigger events' or process of social transformation could lead democracy itself to transform quickly?

One clear brake on time is potentially technological innovation, since technological innovation for effective climate adaptation and mitigation could (particularly in its most radical forms as technology-intensive geoengineering) buy more time in which to develop durable societal responses. But technology can also accelerate time – in the sense that it can reduce the time we have left in which to act to deliver effective climate mitigation and adaptation. For example, technology can accelerate the energy intensity of industrial production, or of other human processes, or the rate at which we are able to deplete the earth's natural resources.

Crisis generally, like wars more specifically, can slow time down when it comes to social progress: putting back the clock, rekindling old animosities and tensions that years of social engineering, development assistance or capacity-building sought to address. But crisis can also speed time up by bringing people together in common cause: crisis can work to accelerate the rate at which social innovation emerges; and the depth and strength of human bonds and social connections.

Here in the UK, one of the most commonly cited examples of this accelerating effect of crisis is the 'war-time spirit' that is said to have emerged during the Second World War. Some advocates have even suggested that if we are to tackle an energy and climate crisis, we will need to move to the equivalent of a 'war footing' in which *"the efforts of individuals, organisations, and government are harnessed together - and directed to a common goal".*[59] History here, as ever, is selective: looting was widespread in the bomb-damaged cities of the UK at the same time as other communities were organising themselves into the Home Front that delivered much of the UK's resilience in the face of adversity. General Elections, with the consent of Parliament, were suspended until the closing stages of the Second World War in 1945.[60] And a regime of rationing and price controls for foodstuffs and household goods was implemented. Whilst it might be considered successful by many, it is also striking that over the period from September 1941 to August 1942, the Ministry of Food successfully obtained 26403 convictions under emergency legislation on rationing.[61]

One example that shows the potential for political long-termism to emerge out of natural resource scarcity; as well as the links between governance responses to scarcity and shared cultural values; comes from Japan. It is not an example of such action arising out of a democracy – for the period in question was pre-industrial Japan of the seventeenth to nineteenth centuries. But it shows the potential for political elites to change their behaviour in the face of an overriding shared interest. And it shows the possibility of a commitment to significant change being sustained over the long term.

The example is described and analysed in a 2007 paper by Roman Krznaric for the 2007/8 Human Development Report. Krznaric asks why Japan today is a 'green archipelago' rather than a 'slum-ridden peasant society'.[62] The answer, he says, lies in woodland management.

In the face of massive devastation of forests to satisfy demand for timber over the seventeenth to eighteenth century, an autarky whose governance structure was rooted in a combination of military dictatorship and some 250 subordinate barons with bureaucracies staffed by samurai, began to develop responses to the problem of forest depletion. In practice, notes Krznaric, most woodland was subject to use by both rulers and commoners. A combination of supply and demand-side controls based on administrative controls and legal sanctions were implemented in the period from around 1630 to 1720. But the *"real saviour of Japan's forests was the development of a positive regime of afforestation during the eighteenth century, which has continued into the present."*

Alongside widespread planting of new forests and the emergence of new forms of silviculture knowledge, changes in landholding arrangements permitted leasing of land to villages or peasants, who planted and nurtured trees.

Two hundred years later, by the mid-nineteenth century, long-term forest stability had been achieved. One factor aiding the recovery, suggests Krznaric, was *"the great concern for the well-being of future family generations in traditional Japanese culture (which partly has Confucian roots)"*, in addition to *"the principle of heredity that shaped political authority."*[63] The country's elites had a long-term vision of hereditary rule which facilitated afforestation policies that would reap benefits only after decades.[64] That long-term vision – or rather, its counterpart in cultural regard for future generations – was able to sustain a series of measures and supporting actions over some two hundred years. In a democracy, one insight that this gives rise to concerns not only the role of supportive cultural norms, but also the importance of political resolve and courage. That in turn links cultural *values* to *leadership*.

Could some of the job be done by policy, law and institutions?

If we are to equip democracy effectively to mitigate and adapt to climate change, remedies to current ailments must stem as much from cultural and social innovation as well as institutional or legal fixes. But policy, legal and (formal) institutional innovations will be among the key shapers of *democracies'* responses to climate change.

Paper Four reviewed some of the legal and policy-based responses that could potentially secure mitigation of climate change. Policy, legal and institutional innovations are also part of the overall climate adaptation toolkit.

Throughout the papers in this project, we have highlighted some of the *barriers* to such innovations within democracies. For example, in *Part V* of *Paper Three* we argued that climate change demands that, where it exists and if it is to remain, democracy needs to develop a capacity for long-term, intergenerationally-regarding decision-making. In part, systems change on the scale that is required needs to stem from cultural processes of transformation (detailed further below). But as we have also suggested, systems change could in part be driven through constitutional reform or institutional innovations, in the form for example of Commissioners for Future Generations.

Helpful contributions can also be made by less far-reaching changes: for example, the UK has brought long-term vision into every-day policy with innovations such as the UK Office for Science and Technology Foresight programme.

The relationship between those approaches to mitigating and adapting to climate change that are grounded in legal or institutional change on the one hand, and those that rely instead principally on cultural or social transformation, is partially symbiotic. The extent to which politicians feel able to 'lead' rather than follow public opinion is a key determinant of what is possible in policy terms. And to an extent it is also a determinant of the state of a democracy (since it would be difficult for elected representatives consistently to be significantly ahead of their electorates without undermining the core precept that democracy is 'by the people for the people').

If processes of cultural transformation ran deep, we might find publics directly driving more radical policy responses to climate change. And even if without such processes, we might find that

investment in communication of available scientific evidence; or civic engagement; or external events; might result in a stronger role for leadership by elected representatives. The potential impact of extraordinary leaders should certainly not be underestimated either.

What, though, are the prospects for engineering processes of systems change and ultimately potentially large-scale changes in human behaviours on the back of shifts in laws and institutions?

There is plenty of evidence that institutions and laws shape human behaviour; but there is also considerable evidence that *overall*, laws in democracies (where only those infringements of law that are considered socially or morally the worst carry the risk of state-sanctioned physical or mental violence) work best when they are grounded in strong pre-existing cultural values.

This is not to say that laws must always follow social values; rather that *in general* they work well when laws are grounded in a strong social consensus. In a related theory of social change through law, so-called 'smart laws' or 'smart regulation' work with the grain of existing organisational or social incentives – for example by incentivising innovation or profit-maximising behaviour in businesses, or providing fiscal reward for desired behaviour change. And the idea that people can be 'nudged' into 'good behaviour' by tapping into subconscious or innate motivations has also gained ground recently in the UK and North America, with a rash of books and policy experiments.

At the same time, there are also many examples of law, backed by meaningful penalties, being used to quash competing values or social beliefs. The removal of capital punishment from the statute books of many democracies – despite widespread public support for the death penalty – is one example. In democracies, the core principle of respect for the rule of law, and the power of the appeal to social cohesion that the rule of law provides, offer a mechanism for overruling competing values or beliefs (at least for so long as the law in question can be democratically upheld or is considered legitimate).

Many people around the world are racist in some form or another (or at least 'in-group' oriented), yet only a few (relatively speaking) would demand that laws against racial discrimination be repealed. Over time, the maintenance of laws against racial discrimination can serve to transform cultural norms, to the point that racism becomes not only illegal *but also* (and in some senses more importantly) socially unacceptable.

One important contribution is Tom Tyler's book *Why People Obey the Law*.[65] Tyler argues that people obey the law not through fear of punishment, but if (and when) they believe that the law is legitimate. This finding helps to explain why people obey laws that do not match their own (personally held) values. And it also suggests that strengthening democracy, so as to strengthen the esteem in which the legislative processes of representative democracy are held, can help to enhance not only the legitimacy of law(s), but also the likelihood that they are obeyed.

Laws and public institutions are not just tools for politicians: they are part of the fabric of democracy. Far from simply being among the outputs of democratic process, they have the potential to alter the character of democracy and the values that enfranchised people bring to their own engagement. That is obviously the case, for example, in the character of Upper Houses within parliamentary democracies. But it is also an insight that can extend to other kinds of legal and

institutional innovations that are explicitly designed to tackle some of democracy's shortcomings in addressing climate change.

Hungary's 'green ombudsman' for example (the Parliamentary Commissioner for Future Generations, discussed in *Paper Three*) creates space for a conversation that would not otherwise happen. At the same time, for effectiveness, the Commissioner's work must always remain connected to the outside world – and to civil society – so as not to become a fig-leaf.

It seems likely in any event that our conceptions of the relevance of future generations will change as we become more aware of the impact of drivers such as climate change, population growth or resource scarcity on the future of humankind. And in Ecuador, a new Constitution now admits nature as a litigant as a result of a process of constitutional renovation.[66]

People versus technology-centred approaches to change

The case for investing in *democratic innovation* in order to deliver effective action to mitigate and adapt to climate change could potentially be undermined by blind faith in markets as a panacea for the world's climate change problems; that same faith also makes it so difficult to decouple liberal democracy from the ideal of a liberal economy. Any *assumption* that effective action to mitigate and adapt to climate change will result from markets or market transformation alone or through investment in technological innovations (most spectacularly geoengineering), amounts to a huge gamble.

Only when elected representatives feel free to prioritise policy priorities that *do not* actively support economic growth is it likely that we will be able consistently to deliver consistent policy for climate change mitigation and adaptation. In turn, that prioritisation is unlikely to happen without: a) consistent and charismatic political leadership of the kind that can inspire commitment of hearts and minds, or b) cultural transformation so that people actively consent to, and pursue, prioritisation of policies that allow collective needs and wellbeing to be met, rather than just pursuit of selfish self-interest.

A people-centred, socially transformative route to mitigating and adapting to climate change offers a far better 'win-win' prospect for change than a business and technology-centred approach that could further erode cultures of democratic decision-making.

In principle, the idea of majority rule – or even consensus-based governance – when linked to the self-interest of individual voters can make it much more challenging for democracy to drive major lifestyle change than for democracy to provide an enabling environment for technological innovation to thrive.

On the other hand, relying exclusively on *technological* innovation to come up with solutions to climate change – both mitigation and adaptation – is a high risk strategy; in part because there is no basis for deep confidence that a mix of technologies sufficient to forestall and combat climate change will come on stream sufficiently quickly. Creating the right enabling environment for some kinds of climate-mitigating technological innovations or responses to climate change may also require large public injections of cash: subsidies. Subsidies can be politically difficult to maintain; not

only when there is public scepticism about climate change, but also for cash-strapped public coffers in many (if not most) parts of the world.

Governments may be able to hide some types of implicit subsidy from their electorates (particularly those subsidies that discount future environmental or social costs so that they are not counted in the present, or that allow uneconomic fossil fuel or nuclear sectors to thrive). But real cash subsidies, once out in the open, require a measure of public support that is hard to maintain if there is scepticism about the benefits that could ensue – particularly if the results are not only distant in time, but also in space.

These distinctions represent gross generalisations, but they seem nonetheless to speak to a fundamental underlying issue: how much will (and can) *we the people* as citizens and residents do to tackle climate change; versus how much can *we the people* as market actors, employees and technological innovators do to tackle climate change?

In the first setting, people are the primary movers. Democracy *as a political system* confronts a direct challenge to innovate and adapt to deliver the necessary shifts in lifestyles and associated values. In the second setting, market actors and the mysterious forces with which they are associated are the principal movers. This fiction limits the role of democracy *as a political system* to that of generating the right policy signals and instruments to enable the market to deliver effective mitigation.

If the current threats of severe climate change (explored in *Paper Four*) were to come to fruition, societal innovation and resilience could prove a far more useful commodity than business-centred policies for economic growth. A people-centred, socially transformative route to climate change adaptation and mitigation potentially offers a far better 'win-win' option than a business and technology-centred approach that could further erode cultures of democratic decision-making.

3. Towards scenarios

Overall analytical approach

The most conventional approach to developing scenarios – stories about the future – is to start by going through a process in which ***drivers of possible change*** in the external environment are identified and clustered according to their possible relevance to a question that is to be considered by the scenarios. In our case, that central question is *how might democracy and participatory decision-making have evolved to cope with the challenges of climate change by the years 2050 and 2100?*

Often, the drivers of possible changes in the external environment are then clustered; conventionally by headings which (with some variations) address the following domains:

- Political (including geopolitical and global governance considerations)
- Economic
- Environmental
- Social
- Technological

One common approach is then to seek to highlight the critical uncertainties in each area (i.e. the factors that make prediction difficult if not impossible in relation to the course of the particular driver of change), and to highlight the extent to which those uncertainties might impact on the central question for the scenarios.

There is one advantage in looking ahead to 2100 in that given a long enough time horizon, almost any change, however radical, becomes potentially plausible; but it also means that few forces or factors can be identified as predictable other than at the highest level of generalisation. However, we can be clearer about some processes than others: for example the shape of overall trajectories in terms of urbanisation, global population growth and energy consumption is relatively clear to 2050. Each of these has significant implications for the impacts of climate change (and the political systems through which human beings manage them). Equally, some of the processes associated with climate change are already hard-wired into the earth's systems, because of the time lags between human activities and their impacts on the Earth's climate.

Technology, population, and economic growth, are also considered as drivers of greenhouse gas emissions in the scenarios (so-called SRES scenarios[67]) on which much of the work of the Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report is grounded. In the context of the IPCC's work, these three 'driving forces' of emissions in the SRES scenarios are all designed to inform *governance responses* in the form, (particularly), of public policy responses. However, current systems of social and political organisation are not identified as *drivers* of change in the SRES scenarios. In other words, it is not possible to use the SRES scenarios and associated data to isolate the impact of democracy on emissions. Rather, the broad assumptions within the SRES scenarios in relation to technology, population and economic growth respectively can be considered

in terms of their impacts on 'democracy for climate change mitigation and adaptation' (see *Table 3* below).

One might propose weak links between some dimensions of the SRES scenarios and democracy by using such limited evidence as exists, for example, on links between 'pre-conditions for effective democracy' – such as the contested criterion of relative income equality. Or one might work with the hypothesis that high emissions of greenhouse gases, or severe climate impacts, are associated with poor 'climate readiness' of democracy. However, the latter is not easy: the 'climate-readiness' of a given democracy at the time when emissions arise may be quite different to its 'climate-readiness' when, often many decades later, climate impacts are felt. Inconveniently, the drivers of greenhouse gas emissions do not generate impacts on democracy at the same pace and over the same timescale.

A great deal depends on the point in time at which the assessment is made – and incidentally on the time delay between policymaking or public decision-making (and the practice of democracy) on one hand, and climate impacts on the other. Taking the raw emissions projections of the SRES scenarios alone, the questions: *"what might have happened to democracy in different parts of the world for a) these emissions and b) these impacts to have arisen?"* remain valid.

Table 3: Outline implications of IPCC Special Report: Emission Scenarios (SRES) for democracy

<table>
<tr><th>SRES Scenario Family</th><th></th><th>Indicative possible implications for democracy</th></tr>
<tr><td rowspan="3">A1 scenario family
A market-based, technology-driven world of very rapid economic growth.

A global population that peaks at 8.7 billion around 2050 decreasing to around 6.5 billion by 2100 and rapid introduction of new and more efficient technologies.

Underlying themes are convergence among regions, capacity building, and increased cultural and social interactions.</td><td>A1F1: fossil fuel intensive (BUT NB: with an assumption that supply meets demand)</td><td rowspan="3">In all cases, a key challenge is to maintain the political will for sufficient investment in technological development to mitigate against the worst effects of climate change in this high economic growth agenda. Democracy evolves without discernable disruption as a result of severe climate change, save for in the remaining circumstances where severe climate events demand immediate action. This could be a 'climate neutral' democracy future, where technology does the job of democratic innovation; but only if climate mitigation and adaptation technologies do not themselves throw up significant democracy challenges.</td></tr>
<tr><td>A1T: non-fossil fuel energy resources</td></tr>
<tr><td>A1B: balance across energy resources</td></tr>
<tr><td>A2 Scenario Family
A very heterogeneous world characterised by high population growth, slow economic development and slow technological change.

Globalisation is weak, with economic</td><td></td><td>The most challenging combination of circumstances for democracy to cope with; with strong pressures both for lifestyle change in highly economically developed countries as a principal pathway to mitigation and adaptation (given the slow pace of technological change) and for interventionist, top-</td></tr>
</table>

development primarily regionally-oriented. Population growth is high (15 billion by 2100) *"because of the reduced financial resources available to address human welfare, child and reproductive health and education"*.		down government interventions to cope with scarcity, migration and public health challenges. Some democracies slip towards authoritarianism as a result of the pressures of managing scarce resources in a time of economically constrained development. Democratic innovation at the grassroots can still be found, if only for reasons of survival in light of severely constrained public sector delivery of services. Some communities experiment with bioregional democracy. The 'have nots' of the early twenty-first century are not lifted out of poverty, and only the most elite 'haves' prosper. Vested interests continue to hold back the potential for democracy to realise the potential of human beings as equals. Global governance systems falter as states pursue approaches of 'unenlightened' self-interest.
B1 Scenario Family The closest to a 'sustainable development future'. High economic growth, though not as rapid as A1. A convergent world with the same population as A1 (global population peaks at 8.7 billion mid-century decreasing to around 6.5 billion in 2100). Greater changes (than A1) towards a service and information economy. Introduction of clean and resource-		Economic growth and cultural transformation combine to deliver liberal democracy based on cooperative values rather than highly individualistic competition. The case in favour of democracy can be clearly made, and a number of authoritarian regimes fall and are replaced by fledgling democracies. Democratic innovation from the local to the global flourishes, with increasing numbers of nations experimenting with institutional means for representing nature and future generations.

efficient technologies and a reduction in material intensity. The emphasis could be on education, equity and social welfare rather than on technological growth, and on global solutions to economic, social and environmental sustainability.		Advocates of a world parliament gain ground. There is greater experimentation with nested/combined global governance approaches in which the 'stakeholder democracy' of voluntary codes and standards is combined with state-centred intergovernmental approaches.
B2 Scenario Family Slower economic growth than B1 A world in that is oriented towards environmental protection and social equity. A world in which *local* solutions to economic, social and environmental sustainability are emphasised. A continuously increasing global population but at a rate lower than A2: the population reaches 10.4 billion in 2100. Less rapid and more diverse technological change than in the B1 and A1 scenario. Cultural pluralism and environmental protection are strong.		The challenge that democracy presents for effective climate action is recognised at a relatively early stage, but progress is hampered by the need to link public opinion to political leadership.

As Working Group II of the IPCC's Fourth Assessment Report itself notes, scenarios are still required *"to describe the future evolution of the world under different and wide-ranging assumptions about how societies, governance, technology, economies will develop for the future"*.[68] And since the SRES scenarios are rooted in an assumption of *no* additional climate mitigation policy measures, they are largely divorced from the social, cultural and political dimensions of climate change mitigation and adaptation. Furthermore, as the Synthesis Report for the IPCC's Fourth Assessment Report notes, projections of climate change and its impacts *"beyond about 2050"* are strongly scenario and model-dependent.[69]

For purposes of our scenarios, each of the three principal emissions drivers that were applied in the SRES scenarios is addressed below. However, we have not sought to correlate the facts and figures used in these later sections of this paper with those (now in many cases superceded by later projections) behind the SRES scenarios. The aim is to explore a set of underlying drivers of change to a sufficient extent to enable development of some *reasonably* credible scenario-based stories.

The approach that we take to arrive at a framework for our scenarios is as follows.

1. To list and describe significant drivers of change in a) democracy AND/OR b) climate change.

2. To rank the level of uncertainty in the general directions of that driver's trajectory to 2050 based on research carried out during the course of the project (everything is uncertain for 2100!).

3. To make a general assessment (based on research carried out for the project) of the degree of uncertainty about the vectors or cause and effect relationships in that driver's impact on the interface between democracy and climate change.

4. To indicate which drivers are mostly significant for democracy or for climate change respectively (i.e. if a driver is mostly significant for democracy rather than climate change, and only significant for climate change because *democracy* is significant for climate change, that is highlighted).

In order to be included as a driver of change, each must be significant for the *relationship* between democracy and climate change.

We are looking to identify specifically those areas where there is both a high level of uncertainty in a) the trajectory of a driver of change to 2050 and b) in relation to proximate factors (cause and effect relationships); and c) where the uncertainties appear to relate directly to issues that are critically significant in understanding the relationship between democracy and climate change.

Consequently, we are looking for those areas where 'uncertainty' speaks both to processes of transformation in greenhouse gas emissions/anthropogenic climate change *and* (allowing for some assumptions about causal relationships) democracy. The greater the relevance of the 'high' levels of uncertainty to the principal points of tension between democracy and climate change highlighted in *Section 2,* the better.

This process lies behind *Table 4* below. Each driver of change is assessed in terms of 'axes' or 'scales' of change, in order to account better for the fact that the drivers are relevant in a *relationship* between two other things; namely democracy and climate change.

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Table 4: **Thirty axes of change in the *relationship* between democracy and climate change (with example 'scales')**

Driver of change	Aggregated Scale/Axis (where useful)		Level of uncertainty over trajectory to 2050? (NB: assume that 2100 is highly uncertain for all drivers)	Uncertainty over proximate factors in context of democracy and climate change links? (i.e. cause and effect when considering the 'driver' in relation to democracy and climate change)[70]	Democracy relevance?	Greenhouse gas emissions relevance? (R = response not driver)	Democracy in the face of climate change relevance?
Politics							
Global governance	Strong	Fragmented	High	Medium	Y	R	Y
Democratisation	Arrested	Advancing	High	Medium	Y	Y	Y
Dominant geopolitical locus	West	East	Low	Low	Y	R	Y
Locus of state decision-making	Centralised	Devolved	High	Medium	Y	R	Y
Armed conflict	Global	Localised	High	Medium	Y	R	Y
Style of state governance	'The market state'[71]	'The civil state'[72] (sic)	High	Medium	Y	Y	Y
Trust in elected representatives	Trusted	Not trusted	High	Low	H	R	Y
Belief in value of	Strong	Weak	High	Medium	Y	R	Y

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public participation in context of democracy							
'Warmist' civil society	Strong	Weak	High	Medium	Y	R	Y
Scientific evidence in relation to issues of societal concern	Extensive and generally trusted	Often distrusted	Medium	Medium	N	R	Y
Style of democratic politics	Consensual	Majoritarian	High (NB: not amenable to generalisation through highly aggregated scenarios)	Medium	Y	R	Y
Public monitoring, transparency, accountability	Extensive	Limited	Medium	Medium	Y	N	Y
Relationship between organised religion and the state	Close links	Limited links	High	High	Y	N	Y
Economy							
Economic growth and the global economy	Thriving	Depressed	High	Low	Y	Y	Y
Economic interdependence	High	Low	Medium	Low	Y	Y	Y

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Role of business	Vested economic interests dictate	In service to social/policy goals	High		Y	Y	Y
Environment							
Planetary boundaries and ecosystem services [NB: climate change not considered as a 'driver' of change for purposes of this *Table*]	Respected and/or valued	Not respected and/or valued	Low	Low	Y	Y	Y
Overall energy demand	Met	Not met	Medium	Medium-low	Y	Y	Y
Energy sources	Mostly/wholly renewable	Mostly/wholly fossil fuels	Medium	Medium-low	Y	Y	Y
Society							
Population	High end of projections	Low end of projections	Medium	Low	Y	Y	H
Demographic shifts and age structure	Within projected ranges	Outside projected ranges	Medium	Low	Y	Y	H
Urbanisation/urban dwelling	Extensive	Less extensive	Low	Low	Y	Y	H
Natural and man-made disasters	Widespread and frequent	Localised and infrequent	High	Medium	Y	R	H
Values, lifestyles and behaviours	Individualistic/competitive	Community-oriented/collab	High	High	Y	Y	H

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		orative					
Religious adherents	Widespread	Limited	High	Medium-high	Y	R	H
Participatory decision-making and engagement in society	Thriving	Patchy	High	Medium	Y	R	Y
Public willingness to base public climate policy on scientific evidence	High	Low	Medium	Medium	Y	R	Y
Technology							
Technological innovation for climate change mitigation and adaptation (including geoengineering)	Extensive	Limited	High	Medium	Y	Y	Y
Technological innovation applied to the *practice* of democracy	Extensive	Limited	High	Medium-high	Y	R	Y
Other technological innovation	Extensive	Limited	High	Medium	Y	Maybe	Maybe (in part)

How to make sense of such an exercise?

If all of the drivers of change in the external environment and their associated responses have implications for one another; how can we make sense both of *those* interrelationships, *and* of their implications for yet another set of relationships: those between democracy and climate change?

We have adapted the heading 'political' drivers since our core scenarios question concerns the relationship between *democracy* and *climate change* (i.e. we are considering, in part, the relationship between the drivers and a political *system*). Equally, we consider participatory decision-making insofar as it relates to, or impacts on, *democracy as a political system*, rather than in its own right and in all the social settings in which it takes place. We therefore highlight those political drivers of change that act on democracy as a political *system* or on climate change. For these purposes, we assume a causal relationship between society, technology, economy, environment and geopolitical drivers on the one hand, and the *political system* on the other.

We consider 'climate change' as a distinct 'impact/response' arena in the space between 'drivers' of change and 'democracy and participatory decision-making impacts and responses'. Our detailed review of climate impacts can be found in *Paper Four* and we do not repeat it in any detail here, though our scenarios draw heavily on that analysis. However, we incorporate a very brief review of the range of possible *responses* to climate change in this paper, because these are closely related both to our axes of change, and to the interaction between democracy and climate change.

The net result is that our scenarios reflect consideration of the impact of the drivers of change on *climate change;* the impact of the drivers of change on *democracy;* and then through the stories themselves, the implications of *climate change* for democracy and participatory decision-making and the *types* of responses that might emerge in different settings.

In highlighting possible 'axes of uncertainty', we are looking for the following.

- Areas where aggregating a (high) level of uncertainty as to trajectory or proximate factors (cause and effect relationships) is helpful to better understanding the relationship between democracy and climate change.
- Areas where 'uncertainty' speaks both to processes of transformation in greenhouse gas emissions/anthropogenic climate change *and* (allowing for some assumptions about causal relationships where we have not identified clear relationships) democracy. The greater the relevance of 'high' levels of uncertainty to the principal (aggregated) points of tension in the relationship between democracy and climate change the better. For these purposes, we have focused on three points of tension:
    - short-termism (linked to lack of regard for future generations);
    - the tension between the ideals of liberal democracy and those of economic liberalism; and

- the challenges associated with democratic decision-making in areas associated with high levels of scientific uncertainty.

In *Section 2* we also highlighted the challenge of *scale* in the relationship between democracy and climate change (i.e. the challenge of identifying the level at which to pursue action, from the global to the local). As we indicated there, this is a problem that is inherent to sustainable development, and impacted by governance (whether it is democratic governance or not), and we do not therefore include it as among the points of tension when narrowing down 'drivers of change' to provide 'axes of uncertainty'.

The following areas of 'high' uncertainty have been rejected as suitable in an 'axis of uncertainty' approach on account of their failure to speak sufficiently generically to our three *overall* 'democracy concerns' in relation to climate change adaptation and mitigation:

a) Trust in elected representatives.

b) Belief in value of public participation.

c) 'Warmist' civil society.

d) *Locus* of state (democratic) decision-making.

e) Style of democratic politics.

f) Participatory decision-making/engagement in society.

'Global governance' has also been rejected because it speaks too indirectly to the practice of democracy at the level of *states* (i.e. national and subnational decision-making). Similarly, 'democratisation' has been rejected because when understood as part of the external environment for *existing* democracies it speaks too little to the problems associated with democracy practice in relation to climate adaptation and mitigation at national and subnational levels.

'Armed conflict' would certainly be a driver of change in the relationship between democracy and climate change, but is perhaps best understood as a subset of other kinds of 'external crisis', or alternatively as an *outcome* of climate change rather than a general driver of change across the key challenges of democracy and climate change. 'Natural/made disasters' have been rejected on the same basis.

'Style of state governance' has been rejected because it speaks principally to a single problem in the relationship between democracy and climate change (the relationship between liberal democracy and the liberal economy).

The relationship between organised religion and the state has been rejected because its implications for 'democracy and climate change' can arguably be seen as a subset of values and speak insufficiently clearly to 'democracy and climate change' challenges. The same goes for 'religious adherents'.

The global economy and economic growth are potentially a major driver of change in the relationship between democracy and climate change – but more relevant is the *kind* of economy and its ability a) to deliver goods and services to tackle climate change and/or b) enable humans to live within planetary boundaries. The 'role of business' has been rejected for similar reasons.

'Technology innovation for the practice of democracy' fails to speak sufficiently directly to the climate-related aspects of the relationship between democracy and climate change; and 'other technology innovation' is insufficiently directly connected to the core challenges at the heart of the democracy and climate change relationship.

This exercise therefore leaves two areas of 'high' uncertainty, each of which has the potential to speak generically to the core problems at the heart of the relationship between democracy and climate change:[73]

> **A. Technological innovation for climate mitigation and adaptation** (from **low tech:** technology is *not* working for climate adaptation and/or mitigation to **high tech:** technology *is* doing a lot of the work of climate adaptation and mitigation).
>
> **B. Values over time** (from **'here and now':** people care about immediate family, friends and neighbours, to **'far and wide':** people care about all others, even those distant in space and time)

It is worth noting that the 'values' axis does not combine 'values and behaviours'. This is because behaviour change may be the result of a wide range of drivers or causal factors aside from values.

There is also an important underlying assumption in B. above; namely that the values associated with behaviours and lifestyles are themselves reflected, however imperfectly, within political systems that reflect a commitment to democracy. That is an imperfect assumption for it is not inconceivable that highly communitarian values could exist within a system of authoritarian government. However, because the central focus for our scenarios is *democracy* not *authoritarianism*, we consider this an assumption worth adopting – flaws and all.

This assumption is also a departure from those scenarios that choose 'social values' and 'systems of governance' as the x and y axis respectively[74] and which implicitly assume thereby that systems of governance might not reflect social values. Here our *starting* assumption is that social values are broadly reflected in the political system of governance. We believe that this is an appropriate point from which to begin an investigation into the impact of climate change on democracy as a political system. Moreover, the scale of the 'systems of governance' axis in existing scenarios[75] tends not to be 'authoritarianism' to 'deliberative democracy' (or some similar equivalent) but rather an attempt to capture the *scale* and level of governance – from autonomous national decision-making to interdependent structures where power is moved or shared, from the local to the global.

One might add to this list another 'faultline' in the relationship between democracy and climate change, which potentially speaks to all three of the core problems in that relationship; namely public willingness

to base public policy on climate science. However, this driver of change is not associated with a high degree of uncertainty *and* impact in relation to our core question. In any event, recent experience of 'climate scepticism' shows close links between 'public willingness to base public policy on climate science' and values (with values being at a higher level of generality).

Existing SRES climate scenarios developed by the Intergovernmental Panel on Climate Change provide reasonably complex pictures/ranges of stories about the future. They account for technology changes over time (though not in terms of their relevance to democracy). *But* they do not take account of possible shifts in politics or in the values or behavioural dimensions of climate change.

If behaviours didn't change *at all* (or rather, moved 'backwards' in terms of their ability to support effective action for climate change mitigation and adaptation), we might find ourselves in the ranges of the Intergovernmental Panel on Climate Change SRES scenarios to 2050 and 2100**.** Our approaches to coping with climate change would then be determined by the range of tools which have evolved as a result of action of other things – including climate change – *on democracy.*

If behaviours shifted (partly, but not only, as a result of shifts in human values) climate change uncertainties would shift too. Such shifts might be under way by 2050, but are unlikely to have achieved transformational change by then given the time lag between emissions and impacts.

If technological transformation allowed societies to cope better with climate adaptation and mitigation, but values didn't, we could conceivably still make use of parts of the SRES scenarios in terms of greenhouse gas emissions trajectories and impacts, though arguably emissions and impacts would reduce because of the relatively high degree of certainty that *some* actions will be taken to mitigate climate change.

At the same time, narratives for the scenarios need to recognise that changes on the 'technology' axis may encompass shifts in worldview. In other words, the *form* of technological innovation is itself susceptible to influence by values, but technological innovation in the abstract is not wholly dependent on the form that societal or cultural values take. Indeed, the mismatch between forms of technological innovation, or its applications, and the dominant values of the day can itself become a source of tension. For example, a Natural England Compendium of Scenarios contrasts the 'old mindset' of technological fix with a new mindset of open-source innovation, and shows that there is the potential for democracy innovation and technological innovation to cause both to merge.[76] The early signals of these changes can be found in thinking about 'crowd-sourcing' and the 'wisdom of crowds', highlighted in *Paper Three.*

Applying our chosen axes of uncertainty therefore results in four scenarios to 2050.

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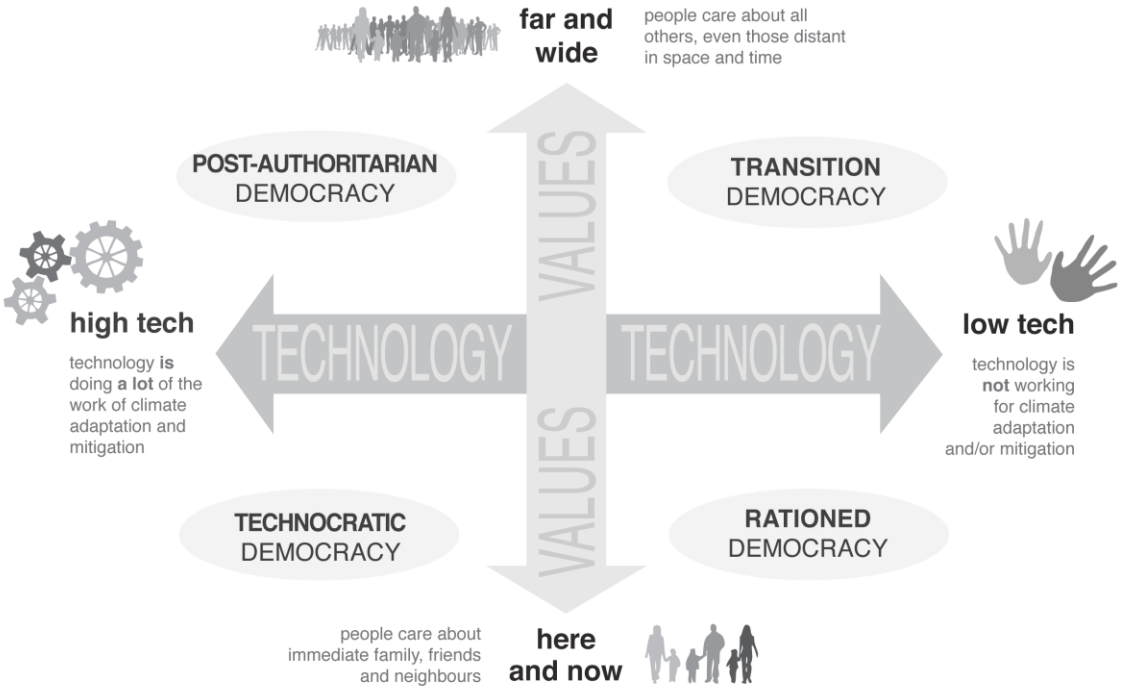
Figure 2 Democracy and climate change scenarios to 2050



For purposes of creating scenarios, we consider a basic two by two matrix with its *x* and *y* axes. This approach is simply the *start* of the necessary process of analysis. *Paper Four* contains the bulk of the 'climate impacts' analysis that we have drawn on to inform the 'climate impacts' side of our current analysis.

Beyond these considerations, we are also struck by the potential relevance of The Ethnographic Futures Framework, developed by Bowman and Lum.[77] They cluster changes by *impacts* rather than according to the different *drivers* of change.

The Ethnographic Futures Framework offers a categorisation of change across five spheres of interaction: how we *define* ourselves (which is closely related to values and beliefs) how we *relate* to others and our environment; how we *connect* to others and our environment; how we *create* new goods, services and knowledge within our environment, and how we *consume* goods, services and knowledge – and dispose of it – within our environment.

This approach is useful for us because it focuses on the *impacts* of change in human relations, rather than the conventional focus on *drivers* of change. Since our concern is democracy and participatory decision-making, an equivalent focus might lead to an approach more tailored to the characteristics of democracy, such as:

- How we *represent* ourselves.
- How, where, when and for what reasons we *participate*.
- How we hold leaders *accountable* (and to *whom*).

- How we *lead* and how we *follow*.

Additionally, we have informally tested our scenarios against what we know about the possible interactions between different drivers of change – notionally checking the outcome of each driver of change against others, and selecting those that do not contradict one another. We allow for a world in which underlying assumptions about worldviews could be challenged.

The central question for our scenarios asks not only how *democracy* might have evolved to cope with the challenges of climate change, but also how *participatory decision-making* might have evolved. Our scenarios narrow the reach of this question in the following way:

- As explained in *Paper Two*, we have limited our inquiry to understanding democracy as a *political system*, rather than as a system of *social organisation* (which would include for example the idea of 'democratic decision-making' within organisations)

- We recognise that democracy as a *political system* exists within a *social setting*, and that over time it is possible that *democracy as a political system* and *democracy as a system of social organisation* could merge. Democracy as a political system could on the other hand itself evolve to look more democracy as a system of social organisation. We therefore take account of the changing relationship between the two, but focus principally on the evolution of democracy *as a political system*.

In some cases the drivers of change that we explore are on the other hand neutral in terms of achieving desired outcomes in the relationship between democracy and climate change. We have made some assumptions about the course of change in these circumstances.

Papers Three and *Four* also highlighted a range of existing scenarios sets on which this paper draws for additional ideas on storylines, events and innovations. In addition we have considered Forum for the Future's 2008 *Climate Futures* report (subtitled 'responses to climate change in 2030'[78]). And we have also drawn inspiration from Natural England's 2009 *Scenarios Compendium* (updated in 2011), which reviews a total of 42 scenario studies.[79] In particular, *Tables 5* and *6* below reproduce the 'emerging issues' timeline set out in Natural England's *Scenarios Compendium*.[80] This provides some useful pointers for dealing with the major uncertainties of some drivers of change. The dates provided are indicative only (as distinct from predictions or projections). Overall, here are some of the points that are particularly relevant to our project:

- The time horizon for our project spans the lieftimes of so-called generations 'Y', 'Z' and 'Alpha', and (assuming that collapse does not occur) into the lifespan of the successor two generations beyond Generation Alpha. A ninety year timeframe spans close to five generations. Each generation could be associated with shifts in worldview.
- If through genetic engineering or cybernetics transhumanism (i.e. a transition to the 'posthuman' is a prospect by as early as 2045, the *demos* of some systems of democracy (i.e. basic determinations about who has rights to participate in democracy in different ways) could be approaching (or undergoing) transformation by as early as 2050.

- If nanotechnology could indeed eliminate food supply and security concerns by as early as 2040-2050, this could potentially coincide with the global population peak around 2050.
- If the technological 'singularity' (i.e. a point at which self-accelerating technological advances mean that extrapolation breaks down and must be replaced by models beyond our current intelligence[81]) is a prospect by as early as 2045, intelligent machines could by then (for those privileged enough to have access to them) help humans to overcome or transcend our biological limitations.
- Changes in architecture, planning and the built environment could significantly alter boundaries between urban and rural; and existing disciplinary boundaries could blur as technologies and sciences converge, with implications for how, cognitively, we comprehend climate science.

The Natural England *Scenarios Compendium*[82] reviews existing scenarios with a view to drawing out common threads and informing development of the agency's scenarios for England's natural environment to 2060. The work leads to identification of a set of common 'composite' stories as archetypes of possible futures:

- *"'Business as usual' for government and the economy*, which is described as *"competitive, market-driven, consumerist, materialist, and featuring little additional change in environmental management"*[83].
- *"A 'high-tech' future transformed primarily by technological fixes".*
- *"A 'sustainability' future that prioritises the environment, and may do so via efficiencies of scale in urban settings or by decentralising and focusing on communities and locales".*
- *"A 'paradigm shift' future that overturns current assumptions about governance or the economy, often connected to worldview and value shifts and enabled by new technologies".*
- *"'Vulnerability' or 'collapse' scenarios, depicting, for example, economic difficulties, social schisms or environmental degradation."*[84]

With the exception of the 'business as usual' scenario, each of the other four 'archetypes' can potentially be (partially) correlated with the two axes of change in our scenarios:

- 'high-tech' future: lots of technological innovation for climate change mitigation and adaptation; values at the 'here and now' end of the spectrum dominate ('technocratic democracy' in our scenarios)

- 'sustainability' future: not a great deal of technological innovation for climate change mitigation and adaptation; values at the 'far and wide' end of the spectrum dominate (though in practice we relate this to 'transition democracy' in our scenarios)

- 'vulnerability/collapse': low levels of technological innovation and values at the 'here and now' end of the spectrum dominate ('rationed democracy' in our scenarios). This might also be associated with Natural England's characterisation of 'business as usual' scenarios.

The 'paradigm shift' future is more difficult to characterise. High levels of technological innovation for climate change mitigation and adaptation with values at the 'far and wide' end of the spectrum might

immediately be understood as a 'paradigm shift' future; but in reality, if the economic model that leads to this future is in essence the same as the present business model, it cannot in any meaningful sense be regarded as a 'paradigm shift'.

One drawback of our scenarios framework is that in focusing on technology and values it may underplay the significance of the *overall* dominant economic models (rather than technology *per* se) in driving change in the relationship between democracy and climate change. It would be wrong to make an assumption that changes in values would necessarily lead inexorably to fundamental changes in economic models: reform might take place through incremental measures for some time, lagging significantly behind a shift in values from 'here and now' to 'far and wide'.

Our key 'axes of uncertainty' themselves incorporate change. After all, the idea that the next forty or ninety years will see little or no technological innovation is very far from 'business as usual', however severe the current recession might be for some of the world's countries. And because 'business as usual' in relation to the drivers of change in democracy and in climate change respectively is so unlikely as to be almost impossible in the medium to long term, we have not focused specifically on describing such a scenario. Instead, we offer an analysis of the existing points of tension between liberal democracy and the effective mitigation of and adaptation to climate change.

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Table 5: Emerging issues clustered by themes and arranged by forecast emergence date [Culture, Values, Generations; Science and Technology Innovation; Economy; Food and Agriculture] *(Natural England:)*

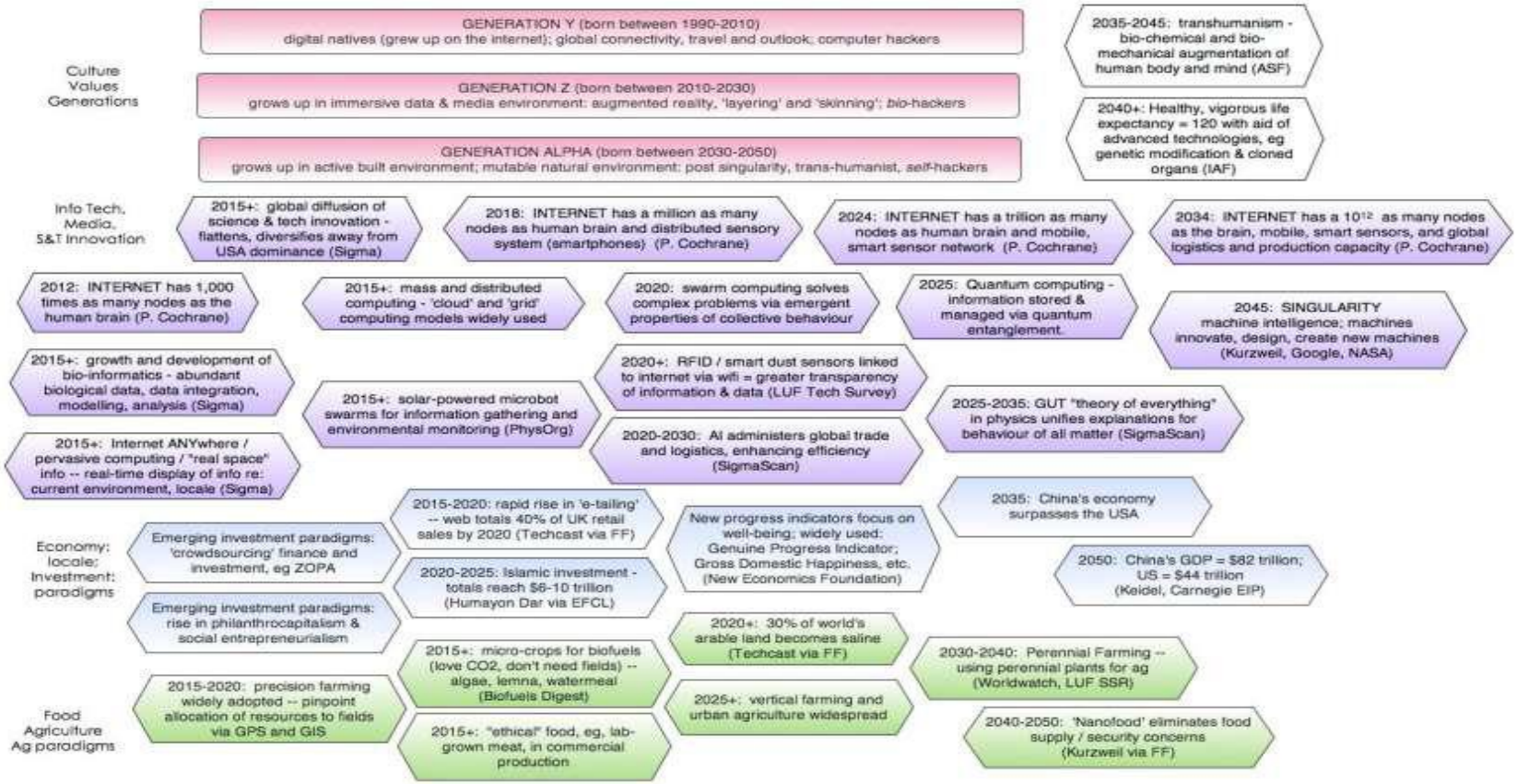

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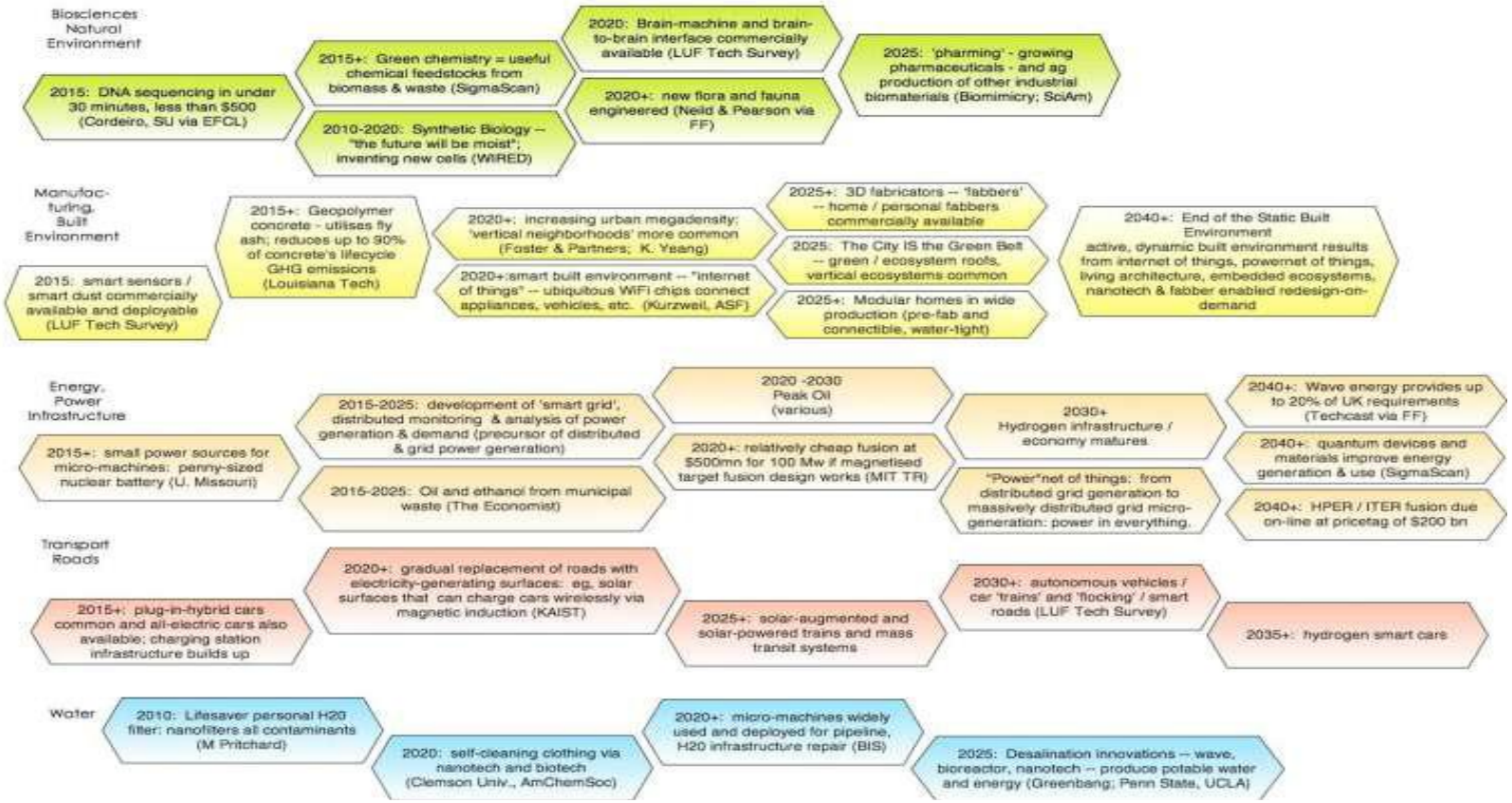
Table 6: Emerging issues clustered by themes and arranged by forecast emergence date [Bioscience, Natural Environment; Manufacturing, Built Environment; Energy; Transport; Water]



Natural England's *Scenarios compendium* notes that *"paradigm shift scenarios are relatively rare"*[85] – and yet, given the number of underlying assumptions to be overcome, these are precisely what might be needed, to approach the 'what would be good?' criteria outlined in *Section 2* above.

Short of paradigm shifts, there are many underlying assumptions in the overall body of literature reviewed in *Papers One* to *Four*, and across a wide range of disciplines. It is helpful, before embarking on an effort to tell stories about possible futures, to expose some of these assumptions – to invite them to climb out of the closet. For if stories about the future are to have the potential to change behaviours in ways that might lead to desired futures, they must be capable of challenging assumptions.

Table 7 is by no means exhaustive, but sets out some of the assumptions that may block desirable outcomes in the relationship between democracy and climate change.

Table 7 Assumptions, assumptions...

Assumptions about decision-making
Faced with the facts about climate change, human beings will make the right, rational, decisions
It seems unlikely that benign dictatorship might come about at the same time as renewed and strengthened systems of democracy and social interaction to deliver resilience and effective adaptive capacity at the local level
It's a waste of time going to public meetings and saying what I think: it's not going to make any difference
There's no point worrying about climate change: if it was really that bad, politicians would be doing more about it
Assumptions about human self-interest
Turkeys will never vote for Christmas
People will always look out for their nearest and dearest: it's only human nature
Cooperation might well be part of human nature; but when push comes to shove it's our competitive nature that will come out on top. Acquiring is more in our nature than sharing
Assumptions about political self-interest
Politicians are only in it for themselves and the vested interests that they serve
Assumptions about economic growth and sustainable development
The idea of 'sustainability' or 'sustainable development' assumes continuity in many of the structures that underpin current social and economic systems.[86]
Someone's bound to come up with an invention soon to deal with climate change
Someone's bound to work out soon how to feed everyone in the world; technology will provide

Sufficient fossil fuels will be available to sustain global energy needs over the coming century.[87]
Assumptions about democracy and global governance
Democracy is cumbersome and messy and incapable of making really tough decisions for the benefit of humankind as a whole
States tend to prioritise national interest over the common good
In a situation where energy security is a key political concern, national governments will be the principal political actors[88]
Local and city-level initiatives become more important as transparency and grassroots pressure on governments increases[89]

Section 4 below describes in separate sections each of the drivers of change. These are not consistently structured because the quality of information available for each is quite different. However the aim in each subsection is to highlight the nature of the driver, along with some insights (where feasible) into how it might evolve, critical uncertainties with which it is associated, and reflections on its implications for the relationship between democracy and climate change.

A concluding subsection recaps very briefly on some of the key impacts of climate change (analysed in more detail in *Paper Four*) and concludes with a stock-take, based on research for Papers *One* to *Four*, of what is known and unknown about climate change, democracy, and governance for sustainable development.

Section 5 contains four scenarios for 2050, and four sketches for 2100 based on the question 'what happened next?' Whilst the flow and structure of each is different, each scenario responds to four key questions:

1. What did democracy or democratic interactions and processes do to get us here?
2. What are people (and businesses) doing in this scenarios? (Attitudes and behaviours)
3. What are the threats to democracy in this scenario?
4. How can democracy, democratic decision-making and institutions adapt to get the best out of this situation and keep the flame of democracy alive?

The aim overall is to answer the question *how might democracy and participatory decision-making have evolved to cope with the challenges of climate change by the years 2050 and 2100?*

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4. Drivers of change

Political

Global Governance and geopolitical issues

Nature of the driver

The scale and quality of *global governance* over the course of the twenty-first century is one of the major contextual drivers of change for both climate change mitigation and adaptation and the shape of democracy more widely.

Here, we revisit some of the key issues discussed in *Papers One* and *Three*. We have not considered the global governance challenges that might arise out of 'unknowable but not impossible' scenarios – including, for example, the possibility that other planets might be colonised. This 'New Age' scenario currently seems extremely distant; not only in the face of economic constraints, but also in light of the end of the competitive impetus that came from the Cold War. Nor have we considered 'baselines' for some of the drivers of change that are likely to be most directly attenuated by climate change and which are not considered separately as drivers within the IPCC SRES scenarios (migration and health being principal among these).

We saw in *Papers One* and *Three* how the formal intergovernmental process of globally coordinated negotiation to agree on the distribution of the costs and benefits of tackling climate change, and the associated intergovernmental commitments, has faltered. In the industrialised OECD countries, one response has been a 'localisation' of climate action through voluntary grass-roots action at community levels.

Drawing on the *Shell Scenarios* report to 2050, broadly two kinds of futures might be possible for global governance: those rooted in competition, and those based on cooperation. These broad alternative visions (more or less global integration, linked to more or less competition) also feature in the IPCC's SRES scenarios.

An approach to global governance based on competition – even coercion - could see a ruthless scramble for increasingly scarce resources, with even the strongest of international institutions (such as the World Trade Organization) finding it difficult to police rules of engagement in the face of increasing threats to national security at the level of states.

A global governance future based on cooperation; itself in a future where communication across borders is facilitated through information technology, would also be likely to see new balances emerging between nation states, and interest groupings that exist across spatial boundaries.

The spatial basis for decision-making would also be likely to shift. Participants in an April 2010 event on *mobilising democracy to tackle climate change*, envisaged a system of 'organic democracy', in which present day political boundaries are replaced with voting boundaries shaped by biophysical realities and ecosystems. The modern day antecedents of such boundaries can be seen in regulatory regimes based on the idea of river basin management – even at the supranational level. Take, for example, the trilateral draft international agreement on water resources management in the Ile-Balkhash Basin, which provides a legal and institutional basis for cooperation between Kazakhstan, China, and Kyrgyzstan concerning the basin of the Balkhash Lake.[90]

Box 3: Shell's Scramble Scenario

Scramble reflects national energy security issues. Immediate pressures drive decision-makers, especially the need to secure energy supplies in the near future for themselves and their allies. National government attention naturally falls on the supply-side levers readily to hand, including the negotiation of bilateral agreements and incentives for resource development. Growth in coal and biofuels becomes particularly important.

Despite increasing rhetoric, action to address climate change and encourage energy efficiency is pushed into the future. Demand-side policy is not pursued meaningfully until supply limitations become acute. Likewise, environmental policy is not seriously addressed until major climate events stimulate political responses. Events drive late, but severe, responses to emerging pressures.

Although the rate of growth of atmospheric CO_2 has been moderated by the end of the period, the concentration is on a path to a long-term level well above 550ppm. An increasing fraction of economic activity and innovation is ultimately directed towards preparing for the impact of climate change.

In *Scramble*, major resource holders are increasingly the rule makers rather than the rule takers. They use their growing prominence in the world to influence international policies, particularly when it comes to matters that they insist are internal such as human rights and democratic governance. Nations who have hammered out 'favourable' deals with oil-producing nations do not want to rock the energy boat they have just managed to board. This results in a world where international relations are mainly a race to ensure continuing prosperity, not the building of a more sustainable international community.

Source: Shell Energy Scenarios to 2050[91]

Box 4: Shell's Blueprint Scenario

Blueprint describes the dynamics behind new coalitions of interests. These do not necessarily reflect uniform objectives, but rather build on a combination of supply concerns, environmental interests, and associated entrepreneurial opportunities. It is a world where broader fears about lifestyle and economic prospects forge new alliances that promote action in both developed and developing nations.

This is not driven by global altruism. Initiatives first take root locally as individual cities or regions take the lead. These become progressively linked as national governments are forced to harmonise resulting patchworks of measures and take advantage of the opportunities offered by these emerging political initiatives. Indeed, even the prospect of a patchwork of different policies drives business to lobby for regulatory clarity.

As a result, effective market-driven demand-side efficiency measures emerge more quickly and market-driven CO_2 management practices spread. Carbon trading markets become more efficient, and CO_2 prices strengthen early. Energy efficiency improvements and the emergence of mass-market electric vehicles are accelerated. The rate of growth of atmospheric CO_2 is constrained leading to a more sustainable environmental pathway.

At the political level, there is increased synergy between national policies and those undertaken at the sub-national and international levels. International organisations – concerned with the environment, global economic health and energy – increasingly agree on what works and what does not.

Source: Shell Energy Scenarios to 2050[92]

Shell's energy scenarios see a global scramble for energy security in their *Scramble* scenario with national governments as the principal political actors. In contrast, the *Blueprints* scenario is

associated with catalytic local and city-level initiatives, with growing transparency and grassroots pressure exerting a 'relentless' pressure on governments to become more accountable.

It is certainly easy, with only weak positive signals of coordinated action between governments to match the scale of the challenge of global climate negotiations (*Paper One*), to see a future based on a breakdown in the significance of global (as distinct from regional) governance of climate change. That possibility becomes more feasible if failure to make progress is linked to increasing recognition of the severity of impacts.[93]

The geopolitics of resource scarcity, particularly those that arise out of the very real prospect of 'peak oil' and other fossil fuel peaks, will generate new governance challenges. Melting ice caps could open up the possibility of year-round Arctic navigation by mid-century, increasing the geopolitical pressure on the governance of Arctic natural resources, including oil and gas fields.[94] Russia may benefit from gaining access to huge new reserves.[95] Already, military and commercial interests in the Arctic Ocean are increasing.[96]

One proposal is to treat the central Arctic as an international space,[97] though that currently seems unlikely because of the commercial pressures on Arctic resources. And there is also a risk that the Antarctic treaty system, which currently protects Antarctic resources from all but limited scientific exploitation, could conceivably collapse in the face of major resource scarcity affecting treaty nations.[98]

Nicholas Boyle argues in his book *2014* that the character of each century is shaped by a great event which takes place by about the end of its first decade.[99] The character of the entire twenty-first century could be apparent by about 2014. Whether the 'major event' that frames its character, however, will be constituted by the events that began with the Arab Spring (itself not unrelated to the future of democracy) or some kind of natural resource crisis or resource scarcity remains unclear.

Critical uncertainties

The principal uncertainty associated with this driver is whether nation states will find ways to overcome the *tragedy of the commons* to pursue the global common interest of humankind in place of national self-interest based on territorial sovereignty.

Other key uncertainties include the following:

- Whether resource scarcity and the geopolitics of natural resource exploitation will be governed through enhanced global cooperation or with a retreat to resource nationalism and unilateralism, or plurilateralism, associated with a breakdown of liberal trade and investment rules.

- Whether new forms of 'transnational' or 'global' democracy will emerge to reflect a decline in the importance of states in global affairs or, conversely, to bring together more closely the potential democracy of 'multistakeholder negotiations' and 'intergovernmental negotiations' in the governance of climate change.

- Whether China's rise to global economic supremacy will be met with a rise in unilateralism and 'fortress' responses by states whose economic power-base is supplanted, or with an ongoing commitment by those countries to economic globalisation and integration.

- The overall balance in the 'scale' of governance in the relationship between climate change and democracy – from the local to the global.

- Whether vibrant democracy – understood as both a political system and as a system of social organisation – could co-exist with a highly fragmented, 'post-globalisation' system of global governance in which the national and sub-national levels had become, politically, the most significant sites of action and cooperation. For example, consider the kind of managed 'energy descent' advocated by the *Transition Town* movement (and described in *Papers One* and *Three*).

Implications for democracy and for climate change

The health and state of global governance will be significant in determining whether, and when, the principal focus for climate-related decision-making will be the local, national, regional or global levels – and consequently which *level* of democracy (and democratic decision-making) will be the most important over time.

At the same time, the *quality* of global governance of climate change – from highly cooperative to highly competitive and/or coercive – is also likely to change. The way in which states behave at global level currently has little apparent connection with their behaviour at the national level (and the practice of democracy at national and subnational levels). But the technology and civil society-driven push towards greater scrutiny of government decision-making at the global level is likely to lead to a greater push for global and national policy commitments to match more closely.

The overall reach and power of the global governance system; whether within the UN or elsewhere; will have a major impact on the locus of decision-making on the security threats posed by climate change. These threats go beyond competition, and even the possibility of armed conflict, in the struggle for appropriation of scarce resources, and extend to management of global migration.

Democratisation

Paper Two described Samuel Huntington's characterisation of processes of democratisation in three 'waves': three major 'long' waves in 1828-1926, 1943-1962, and 1974-; and two 'reverse' waves in 1922-1942 and 1958-1975.[100] However, there are alternative views too. For example, there could be a 'fourth wave' beginning with the fall of the Berlin Wall in 1989-1990. And Dirk Berg-Schlosser[101] describes distinct long-term 'waves' and briefer turmoils which he calls 'conjunctures': points in time which can become 'fluid' in the sense that possible outcomes can go in different directions.

Today, democratisation is by no means on a steady course towards an eventual state of 'democracy' in all countries. China is the most economically and politically powerful country to swim against the tide. More widely, Larry Diamond writes that "*in a few short years, the democratic wave has been slowed by a powerful authoritarian undertow, and the world has slipped into a democratic recession*".[102]

Launching its 2008 Democracy Index, *The Economist* confirmed a worrying correlation between economic and democratic stagnation.[103] John Kampfner goes so far as to highlight a risk that the process of democratisation may have reached its high water mark.[104] The democratic promise of the Arab Spring of 2011 remains too faint to confidently retort that that is not the case. And in its 2011 Democracy Index, *The Economist* notes that:

> *"Global backsliding in democracy has been evident for some time and strengthened in the wake of the 2008-09 global economic crisis. Between 2006 and 2008 there was stagnation; between 2008 and 2010 there was regression across the world. In 2011 the decline was concentrated in Europe. Seven countries in western Europe had a decline in their democracy score in 2011; none had an increase. The main reason has been the erosion of sovereignty and democratic accountability associated with the effects of and responses to the euro zone crisis... Harsh austerity, a new recession in 2012, high unemployment and little sign of renewed growth will test the resilience of Europe's political institutions".*[105]

Whatever the past pattern of 'democratisation waves', it seems clear that 'waves' may reverse for periods of time. The shape of the next (or current) wave of democratisation is likely to be strongly influenced by many factors including technological innovation (and the divides and shifts in structures of social representation that it creates); and global economic and environmental challenges. Indeed, we can be reasonably confident that natural resource scarcity or severe climate impacts might themselves trigger 'reverse waves'.

Critical uncertainties

In relation to the future evolution of this driver, there is considerable lack of certainty over the relationship or correlation between democratisation and other external drivers of change. Negatively, there is some evidence to suggest that there is a correlation between economic and democratic stagnation. There is a lack of confidence that democratisation overall will continue in a positive wave and some evidence that a 'reverse wave' may be under way. There are only weak signals from North Africa and the Middle East to suggest the opposite.

Implications for democracy and climate change

Peter Burnell explores the links between climate change and democratisation in a paper for the Heinrich Böll Foundation.[106] He notes that *"[t]he challenge of building democracy against a background of material deprivation is demanding enough. But trying to persuade needy people to vote for economic sacrifices in the interest of reducing greenhouse gas emissions surely adds up to an unlikely – if not also an unreasonable – combination"*.[107] At the same time, the instant that elected representatives begin to ignore the expressed wishes of their people, the more cynicism about democracy is likely to result. Burnell argues that climate mitigation may effectively be set in opposition to democratisation and development.[108]

Burnell quotes Walker, who says that *"the question should not be whether democracy is good for the environment but how and when democratisation, in its varying forms, can change the structures governing decision-making and access and control over material resources in ways that favour social and environmental objectives."*[109]

In a thoughtful and wide-ranging analysis, Burnell draws four conclusions:

- *"Democratization does not necessarily make it easier and can make it more difficult for countries to engage with climate mitigation*

- *Democratization might improve the chances of adaptation in the interests of protecting the most vulnerable, but should be considered neither a prerequisite nor a sufficient condition*
- *Global warming may be problematic for democratization, but its effects on society can generate a variety of political demands, and the political outcome will depend on (among other things) how well the existing political arrangements respond to climate change effects.*
- *Adapting successfully to climate change and securing people from its harmful effects should help societies attain or sustain stable liberal democracy, but other types of regime (that may or not be preferred by the populace) could strengthen their position in this way, too*".[110]

Dominant geopolitical locus

The overall picture is clear: the world is undergoing a major shift in the axis of economic (and hence geopolitical) power from West to East; particularly as China and India regain their older places at the centre of global geopolitics on account both of population and economic might. We provide further evidence of this shift below where we consider the distinct drivers of population growth, demographic change, and economic growth respectively.

Critical uncertainties

The overall trajectory of this driver is reasonably clear. What is less clear is the range of impacts and responses to the world's shifting geopolitical locus; for example whether the United States will adopt essentially nationalist, protectionist responses to the political and economic rise of China; or whether it will instead adopt a more significant role on the global stage, pressing for greater coordination and more effective global governance mechanisms to tackle global challenges. Equally unclear is the extent to which Asian forms of 'democracy' may powerfully shape international institutions and their processes, exacerbated by an 'envy factor' as citizens in economically declining democracies look to Asia and wonder if it is democracy that holds them back.

The Eurozone crisis of 2011 also points to the profound implications of a shift in economic might to the East, particularly China; with pressure on China to help bail out struggling nations within the Eurozone. China's cautious response needs to continue to be read for the signals it provides as to whether regional fragmentation or greater global integration will emerge out of the financial and sovereign debt crises.

There is a case, too, for looking to history to provide signs of possible choices now. Professor Ian Morris of Stanford University looks back to the economic collapse of Japan and China in the 1860s and concludes that Europe should tread with caution before accepting Chinese loans:

> *"China's rulers borrowed heavily from overseas, squandered the capital, and fell into dependency. Japan's rulers bought time, raised huge amounts of local capital and financed an indigenous industrial revolution. By 1911, Japan was a great power and China was the sick man of Asia".*[111]

Implications for democracy and climate change

Against a background of the emerging economic power-shift towards the East, Peter Burnell notes that "*the groups who benefit most from economic growth use their increasing political influence to*

transfer costs or burdens of adjustment to other social groups – including the most vulnerable, the least well-off". He argues that whether a country is a democracy or a non-democracy seems hardly to make a difference. From that perspective, whether the US or China is the world's dominant power might matter little. This reality – and the associated challenges facing governments and states in selling measures to their electorates that hamper economic wealth - also underscore the difficulty at global level in selling *any* global deal on climate mitigation to the rapidly growing middle classes of emerging nations.[112]

Burnell suggests that *"the expectation that countries like China, India, Indonesia, Brazil, Mexico, and South Africa will play a fuller part in curbing a future increase in greenhouse gases must prompt questions about whether the political context inside these countries could permit this and the likely domestic political consequences, given the political priority to address poverty"*.[113]

Furthermore, he points out that a number of countries that are not liberal democracies are (or soon will be) responsible for considerable greenhouse gas emissions: China, Russia, Saudi Arabia, Iran. Others (including Qatar, Kuwait, UAE and Brunei) are not democracies and have very high per capita greenhouse gas emissions. And there are also some poorer countries *"that do not have a consistent record of freedom and democracy"* that also have relatively high *per capita* emissions as a result of deforestation and agricultural practices.

Whilst India has been a democracy for more than fifty years, there are other key countries (South Africa, Brazil, Mexico) that have only recently gained or regained their status as democracies. There is also a mismatch between countries at risk from climate change (such as low-lying Pacific island states or emerging but 'barely stable' democracies such as Nicaragua and Honduras) and carbon emissions: many of those most at risk have very low emissions.

Much of Burnell's analysis resonates irrespective of shifts in global geopolitical power. But the possible intensification of political challenges associated with tackling climate change in so-called 'emerging' economies is also likely to make it more difficult for democracy fully to adapt to climate change. For not only is poverty reduction an important priority in those countries, but a rapidly emerging middle class is likely to flex its muscles. Unless the values and economic incentives expressed through these behaviours support urgent action to mitigate and adapt to climate change, the shift in economic and political power from West to East may not prove to be a key driver of change.

Locus of state decision-making

The *locus* of state decision-making can have a significant impact on the kinds of policy tools that may be deployed to deliver environmental and social outcomes. For example, a highly centralised state is more likely, perhaps, to deploy nationally applicable top-down command-and-control responses to climate change or a centralised approach to spatial planning and zoning. The *locus* of decision-making also has significant implications for the spaces in which voters participate, and potentially the issues on which they may choose to engage.

The balance between centralised and devolved decision-making is also likely to impact on voters' perceptions of leadership, representation and accountability, and on the confidence with which states show leadership or adopt negotiating positions in the global governance realm.

Peter Burnell points out that despite the huge barriers to effective action on climate mitigation at the federal level in the United States, and the failure of the US to sign the Kyoto Protocol, dispersion of institutional power has permitted thriving carbon-reduction initiatives at local, city and state levels.[114] At the same time, highly devolved decision-making; such as the 'localism' of the current UK government, for example, brings no guarantee that effective action on climate change will result. As we argued in *Section 1* above, local communities can be as profoundly self-interested, or conservative, as any national government.

However, economic recession and rising unemployment may provide a spur to stronger community action as relatively similarly-affected communities come together to adapt to new circumstances in the face of ineffective government responses.

Armed conflict

Armed conflict is one of the 'wild cards' of futures scenarios, because it has the potential to trigger massive social crisis; migrations; major demographic changes and, in the worst case scenario of nuclear warfare, the utter annihilation of millions of people and vast areas of previously habitable and habited land. At the same time, wars seem deeply unpredictable. And whilst up to a point war can boost economic activity (since it requires a massive expenditures of state resources), it also drains public coffers. For those countries or regions whose territories form the battleground, they fracture and destroy lives and hold back lasting economic development. At the same time, wars *can* also lead to strengthened community cohesion by binding people together against a common enemy - at as long as 'the enemy' can be identified.

The poles 'global' and 'localised' are proposed for this driver of change on the (sad) assumption that there will always be some warfare somewhere in the world. The overall effect of war on democracy, and on climate change, will in part be determined by the impacts of wars on the economy and their contribution to other drivers of climate change (including greenhouse gas emissions and population growth). But at the extreme of a 'global' war; or rather a war with widespread and global effects (for example as a result of biological or nuclear warfare, or because the terrains and theatres of war are worldwide); it becomes difficult if not impossible to imagine dramatic changes in societies as a whole and in decision-making processes, as well as in the balance between global, national and sub-national decision-making, whether democratic or not.

David Keane's muse, speaking from a future around the year 2059 looks back on a proliferation of new weapons systems with killing power *"far greater than that of all democracies combined"*.[115] She notes that the *"first few decades of the new millennium"* would see the *"collapse of the distinction between war and peace"*.[116] Democracies tarred with the brush of war, or those who had gone to war in the name of democracy, could not make the old argument that democracies were 'essentially' peaceful. And increasingly, democracies found it hard to win asymmetric conflicts, she says, against *"tightly disciplined, decentralised Hizbollah-style armies enjoying strong local support"*.[117]

In this future, democracies came to be forced periodically to learn to live with losing wars and Keane's muse wonders "*how many people around the world would reject the American talk of democracy as a mask for violent power manoeuvres that had little or nothing to do with democracy, and much or everything to do with the perceived material interests of the dominant power*".[118] Related to this, as Nicholas Boyle points out, "*you cannot claim to be a self-determining people if America is the sleeping voter in any ballot you may hold on your collective future, and if the outcome is always subject to an American veto*".[119]

Beyond the trite remark that the future course of wars is deeply uncertain, it is worth noting that whilst war could directly impact on greenhouse gas emissions (through its impact on production and consumption processes), it also represents one of the possible areas of *impact* of climate change.

Strictly speaking, this is not the place to assess the impacts of climate change on armed conflict (as distinct from the impact of armed conflict on climate change). But one of the most significant assessments of links between climate change and security (albeit from a national, US, perspective), is the 2007 report of the Military Advisory Board: *National Security and the Threat of Climate Change*.[120] The Advisory Board's members; all with military backgrounds; note the implications of climate change as a threat multiplier across some of the world's volatile regions:

> *"Economic and environmental conditions in already fragile areas will further erode as food production declines, diseases increase, clean water becomes increasingly scarce, and large populations move in search of resources. Weakened and failing governments, with an already thin margin for survival, foster the conditions for internal conflicts, extremism, and movement toward increased authoritarianism and radical ideologies."* [121]

Climate change will add to tensions even in stable regions of the world:

> *"The U.S. and Europe may experience mounting pressure to accept large numbers of immigrant and refugee populations as drought increases and food production declines in Latin America and Africa.."*[122]

The report notes further that *"the major impact on Europe from global climate change is likely to be migrations, now from the Maghreb (Northern Africa) and Turkey, and increasingly, as climate conditions worsen, from Africa".*[123] As a threat multiplier, climate change could generate deep social unrest even if it does not trigger armed conflict.

Style of state governance

How the relationships between state, market and civil society unfold over the coming century could potentially be among the defining characteristics of the quality of democracy, and democracies, around the world. The relationship between state and market has been in flux since the emergence of the modern nation state around a hundred and fifty years ago. At one extreme, US academic Philip Bobbitt argues that the twenty-first century is witnessing a major shift from the old form of constitutional order represented by the nation state to a new form represented by 'the market state'.[124] The market state also tends to "*privatize many state activities and [make] representative government more responsive to the market*".[125]

The emergence of the market state need not represent the outright trumping of state by market, but rather the redefinition of the relationship between the two (a point that is reiterated in Shell's Global Scenarios to 2025).[126] If Bobbitt's vision of the emerging market state is right, there is still a need to rely on other drivers of change if we are to "*develop those values and institutions that the market state does not develop: those of collaboration, of decency, of deference, of the protection of cultural communities".*[127] Philip Blond argues the case for a civic state, which privileges *"the associative above the alienated, the responsible over the self-serving and... the communal over the individual"*.

A different view is taken by Michel Bauwens, whose Partner State sees itself as "*steering, supporting and enabling local communities and business ecologies and their intersection with global networks of information exchange"*.[128] Importantly, he argues that *"[i]n a world which will soon face a dramatic series of serious ecological crises, with dwindling natural resources, what we can envisage as a new model is the co-existence of global-local open design communities operating through the internet, combined with local production capacities, a 'built-only' capitalism that respects natural limits."*[129]

Many of these visions of the role of the state lose descriptive force in the shape of major natural resource challenges that have, at their extreme, the potential to bring societies to collapse. There is little room, for example, for the market state to maintain a descriptive hold in some of David Holmgren's energy descent scenarios (discussed in *Paper Three*).

Trust in elected representatives

In *Paper One* we highlighted the overall democratic malaise that stems from lack of trust in elected representatives. John Keane's major work, *The Life and Death of Democracy* (2009), argues that the West now finds itself in a phase of 'monitory democracy'. A central feature of this new form of democracy, as Keane sees it, is a process of surveillance and disciplining of politicians and elected power-holders via publicity, civil society campaigning, watchdogs, access to information, and constant news feedbacks. And yet, one of the prices paid for that monitoring – for all that it holds elected representatives accountable – is its capacity to reveal the inner workings of contemporary democracy, with its links to vested interests and the self-promoting scheming of politicians. One outcome is a deep lack of trust in elected representatives. Keane's muse, speaking from the future, notes that "*[h]ypocrisy... was the soil in which antipathy towards democracy always took root*".[130]

Whilst lack of trust in elected representatives might generally be taken to provide an indicator of malaise within democracies – indeed, it *drives* malaise and political apathy – it appears that it is not a helpful proxy for *lack* of democracy. For example, the World Economic Forum's Global Competitiveness Indicators incorporate data on 'perceptions of public trust in politicians'. A table of responses based on weighted responses from an executive opinion survey (as distinct from a random poll) in the 133 countries in the Global Competitiveness Index for 2008-2009 (highlighted in *Paper One*), does *not* show any obvious correlation between the 'democracy' ranking of a country and its ranking in terms of 'perceptions of public trust in politicians'.

Whilst there might be only mild surprise that Singapore emerges in first place (with a score of 6.4 against the question "*How would you rate the level of public trust in the ethical standards of politicians in your country? (1 = very low; 7 = very high)*", it is more surprising to find that Qatar comes third and the United Arab Emirates fourth, equal with Luxembourg and just ahead of Sweden Norway and Switzerland. China is ranked 26th, with Azerbaijan 35th and the UK and US are in 41st and 43rd place respectively.

Public trust in politicians is rated low in some countries that are among those conventionally considered among the 'most' democratic.

There is a great deal of uncertainty about the overall course that this driver of change will take. Much, in particular, is dependent on events such as corruption or expenses scandals, or evidence of other kinds of impropriety.

In the penultimate chapter of his major work, David Keane's muse looks back from roughly the year 2059 or 2060, to examine the sources of the *"stresses and strains and pinches and pains"* felt by all democracies at that time. She argues that the stresses and strains are traceable to *"problems not easily solved by monitory democracy"*. She highlights *"People's deep misgivings about politicians, parties and parliaments"*, which see people still engaged, but not via party politics. A decline in the ratio of political party members to the electorate as a whole was associated, she says, with citizens concluding that party membership was *"no longer meaningful"*[131]; and politicians and parties trying to exercise a *"stranglehold over the process of representation of a growing variety of social and political interests"*.[132]

It is easier to suggest causal relationships between the behaviour of political elites and trust, or lack of trust, on the part of members of the public. As we saw in *Paper One* for example, a UK opinion poll by Ipsos MORI for the Royal College of Physicians published in October 2009 showed politicians and government ministers to be the 'types' of people least trusted generally to tell the truth in a list of sixteen which included the ordinary man/woman in the street. And at a time of public scandal related to expenses claims made by Members of Parliament, just 13% of those people questioned said that they trusted politicians generally to tell the truth (down eight points from the previous year). Doctors emerged in first place, with 92% of those questioned generally trusting them to tell the truth.

Attaining the trust of the public is a struggle in any democracy. And like corporate reputation, trust, once gained, is easily lost. Yet without high levels of trust in elected representatives, the kind of strong leadership that might be necessary to rise to the challenges of climate change is far more difficult to exercise.

Belief in value of public participation in context of democracy

Both participation and representation depend for their health on the overall level of informed awareness of the voting population. But the reality is that most people are uninterested in politics. In any social organisation or public decision-making context it is unusual for more than a small number of people to take up decision-making. Michael Mason also stresses the central dilemma: *"Most citizens remain uninvolved in public affairs while the state is preoccupied with aggregating the*

political preferences expressed through voting or lobbying ... the economic sphere also stands insulated from any democratic interrogation".[133]

Understanding 'belief in the value of public participation in the context of democracy' as a driver of change in democracy, then, is to single out one of the most significant *problems* in contemporary liberal democracy.

As a practice, the idea of participatory democracy is particularly concerned with the problem of ensuring collective, participatory decision-making at all levels through the continuous involvement of the citizen in the governance of society. The idea goes beyond decision-making in the formal realm of representative politics, to address issues of participation in organisations and in particular in the workplace – but for this driver, we focus on participation in representative politics. We consider the *social* setting for participatory decision-making and engagement in society more broadly (i.e. not necessarily connected with the formal businesses of representation and government) in a later driver.

In the field of climate change, the idea of deliberation; that is, participation and public decision-making grounded in informed and structured debate about alternatives; offers a response to the democratic challenge of finding space for expertise, and for science, without compromising 'rule by the people'. There is certainly evidence that when people are engaged in a different, much more proactive and deliberative way than usual on an issue like climate change, very different outcomes and views may emerge when compared to those of traditional opinion polls.[134]

However, the ideal of a democracy grounded in the widest possible public participation remains particularly vulnerable to the assertion, frequently attributed to Oscar Wilde, that *"the trouble with socialism is that it takes too many evenings"*. If deliberative democracy is to play a more significant role in the variety of ways in which democracy functions, it will be important that at least a significant part of the population is actively interested in being active; that is, in participating in ways that may be unusual and uncomfortable. That may in turn require significant changes within established democracies that have become sclerotic; with low levels of formal engagement in political life.

There is considerable uncertainty about how low levels of belief in the value of public participation drive changes in democracy and, through democracy, climate change.

At a minimum, we might suggest that low levels of belief in the value of public engagement offer elected representatives fewer meaningful signals on public opinion and how best to 'represent' the electorates that they serve. This potentially drives political elitism, and a vicious cycle in which political and policy decision-making is dominated by vested interests, fuelling further scepticism and a lack of willingness to engage by the public.

Strong political leadership by both community leaders and elected representatives can play a valuable role in turning round citizen apathy, but so too can efforts to nurture and sustain social inclusion more broadly. To the extent that social *exclusion* is associated with low levels of interest in

political engagement and participation, this driver may itself be associated with a widening of inequality as climate change impacts bite and hit the poorest and most marginalised hardest.

It is important here, though, to distinguish between belief in the value of public participation at the national level and belief at the local or community level. In Western Europe, wider interest in *self-organised* public participation at community level was *itself* among the most visible responses to climate change governance failures at international and national levels. But this interest need not necessarily translate into a belief in the value of participation in *formal* democratic processes, such as those associated with municipal government decision-making on issues from spatial planning to conservation. That belief, we might speculate, is associated with relative trust in elected representatives and the role of vested interests.

Belief in the value of public participation in the context of democracy is also closely linked to the health of civil society, which we consider, in part, as our next driver of change. We also consider a closely related driver, namely the *extent* of participatory decision-making and engagement in society as a distinct driver of change related to the Social drivers heading, below.

'Warmist' civil society

This driver focuses on those parts of civil society that recognise or support the basic principle that human activities may lead to change in the world's climates. In other words, it is a driver of change related to the activities of one part of civil society.

We have made a general 'civil society' driver more specific in order to connect it more closely to our core scenarios question. For whilst the health of civil society generally might be taken crudely as a proxy for the health of a democracy, civil society is as varied as human values and beliefs.

Notwithstanding some scenarios which tell stories in which 'climate denial' is criminalised, we recognise too that 'climate sceptic' civil society will potentially impact both on climate change and on democracy. Rather than separating out that part of civil society, however, we propose that it be considered in relation to the state of 'warmist' civil society, from 'strong' to 'weak'. (And it is worth mentioning that we have not chosen to explore separately the relationship between the state and the individual; understanding that as an 'impact area' of our drivers, rather than a driver in itself).

As we saw in *Paper Two*, civil society is a key space in a vibrant democracy. Many thinkers have argued that participation of the citizen is perhaps best achieved on a collective scale that functions independently of the state. Ideas about 'civil society' and the 'public sphere' are important here. As a practice, participatory democracy is concerned with the problem of ensuring collective, participatory decision-making at all levels through the continuous involvement of the citizen in the governance of society. That idea goes beyond decision-making in the formal realm of representative politics, to address issues of participation in organisations, in interest groups, and in particular in the workplace. Participatory democracy therefore has implications not only for the organisation of the state, but also for how society is organised.

In *The Civil Sphere*,[135] Jeffrey Alexander suggests that democracy and civil society are inextricably

linked. Alexander asserts that civil society and democracy have developed in tandem, with civil society acting to safeguard democracy's most fundamental virtues: equality and solidarity.

Civil society has also come to be seen as central in facilitating a more informed, aware, active society that is able to hold its representatives accountable. The term 'civil society' has not acquired a consistent meaning; but it generally includes non-governmental organisations (NGOs) and voluntary associations, as well as individuals acting in their capacity as citizens.

In 2011, as a result of the ongoing financial crisis, it is at least arguable that the world is seeing a shift towards values fostered by progressive elements of civil society. In the UK context, the Carnegie UK Trust's Inquiry highlights the fact that civil society's focus on the value of wellbeing might come to trump the current market-driven obsession with economic growth as the paramount societal goal. This finds resonance in the approach already taken most famously by Bhutan, which in 1972 declared its pursuit of Gross National Happiness.

Civil society and market actors can also interact productively, despite their potentially deeply divergent core values. Philip Blond's conceptualisation of the *'*civic state*'* is based on a *'remoralisation'* of the market so that economic policy is tied to social and environmental outcomes: the extension of wealth, assets and the benefits of ecological and social well being to all.[136]

The emergence of climate change as one of the twenty-first century's key global problems invites a reassessment of the existing and future interplay between state, market and civil society. The Carnegie UK Trust's 2010 report *Making Good Society*, argues that the challenge of climate change demands a bigger role for civil society in the future: *"Neither state nor market action will be adequate to meet the scale of the challenges, nor will they ensure that the costs of climate change and resource scarcity are fairly distributed. Civil society has a critical role to play in making sure that the transition to a low carbon economy is effective and fair".*[137]

The argument that civil society is best placed to tackle climate change has arisen, in part, out of the perceived failure of states (at the national and international levels) to deliver an adequate climate strategy. Grassroots civil society networks such as the UK's burgeoning Transition Towns movement (see *Paper One*) are now mobilising to make a contribution to tackling the problem themselves through local and community-based action.

There are a great many uncertainties associated with the impact of 'warmist' civil society in relation to democracy and climate change. The health of formal organised civil society tends to depend on the availability of funding; which is itself dependent on the popularity of the issue for which funding is sought and therefore related to economic factors. How people absorb the messages of civil society groups is closely connected to values and to the framing of those issues.

There are many different kinds of civil society groups. Think tanks may thrive at moments in time when it is clear that old ideas and ways of doing things are no longer adequate. Market-oriented civil society groups might thrive in a political environment in which social entrepreneurship is actively encouraged. More generally, the strength of 'warmist' civil society, and its impact, is linked to the strength of public concern about climate change.

Scientific evidence in relation to issues of societal concern

Papers One, *Three* and *Four* explored some of the links between public trust in scientific evidence and effective action on climate change mitigation and adaptation. For purposes of *Table 4*, we suggest that appropriate scales in relation to this driver of change might appropriately run from 'extensive and generally trusted' to 'often distrusted'.

Scientific evidence is relevant to many more issues of societal concern than simply climate change. Thus far, the relationship between scientific uncertainty (or lack of consensus) and societal impacts has been clearest, in the West at least, in relation to GM products, climate change, and Bovine Spongiform Encephalopathy (BSE). However, coming waves of technological innovation, particularly synthetic biology, will almost certainly raise many new issues about science, risk and precaution; so that a current (often healthy) discussion between so-called 'climate sceptics' and 'warmists' could be replicated in many other public debates.

Issues about the balance between a people-led democracy on the one hand and expert-led technocracy on the other are central in this driver of change. We have awarded it only a 'medium' level of uncertainty because the overall dynamics associated with the driver are reasonably well-established.

On the one hand there are advocates whose work bridges the gap in communication and understanding between scientific experts and elected representatives or (more directly) members of the voting (or participating) public. On the other there are those who genuinely believe that unless expertise and scientific knowledge is given a more prominent role in policy-making and political decision-making about climate change, it will be impossible to counter the tendency for short-sighted self-interest to dominate policy-making and political decisions on climate change.

The Council of Europe's Green Paper on the *Future of Democracy in Europe*,[138] highlighted in *Paper Three*, offered intriguing insights into the potential for expertise and representation to combine in new ways in the face of climate impacts. The Green Paper devotes considerable attention to the role of what it describes as 'guardian institutions' in decision-making – that is, institutions made up of experts. Over the past 20 to 30 years, the paper argues, the scope of democratic decision making has been eroded both as a result of 'guardian institutions' addressing problems by relying on specialised knowledge and expertise, rather than citizen engagement or political representation, and through public policy making through agreements with stakeholder-based (rather than citizen-based) governance networks.

The future of democracy, argues the paper, will depend on responses to two questions:

> *"Can the apparent loss of democratic legitimacy be compensated by other forms of legitimacy underlying "guardian" and "governance" institutions?*
>
> *Can non-majoritarian institutions of guardianship/governance be reconciled with and justified by reforms in democratic practices?"*

The middle ground lies with those who seek to create greater public opportunities for participatory or deliberative decision-making on issues where scientific evidence is a key source of analysis on risks and impacts.

Questions related to the role of experts are also important undercurrents in the development of a variety of forms of 'crowd-based democracy', in which decisions of many kinds are made on the basis of aggregated information submitted by large numbers of individuals ('crowds'); often by means of social networking and electronic participation technologies.

Style of democratic politics

The style of democratic politics within a country – from national to community level – is potentially a significant driver of change in both democracy and climate change.

Aren Lijphart's empirically based *Patterns of Democracy*[139] examines the performance of thirty-six democracies based on a range of institutional characteristics including the organisation and operation of executives, legislatures, party systems, electoral systems, the relationships between central and lower-level governments, interest groups and central banks.

Lijphart distinguishes between two basic types of democracy: 'majoritarian' democracies (of which the UK is a model) and 'consensus' democracies (e.g. Switzerland and Belgium). Whilst the majoritarian model concentrates political power, the consensus model tries to 'share, disperse and limit power in a variety of ways'.

Lijphart's distinction is helpful in reminding us that there is no single model of contemporary democracy. And his review also offers wider insights into our effort to consider the future of democracy in the face of climate change. Assessing the performance of thirty-six democracies, Lijphart concludes that consensus democracies clearly outperform majoritarian democracies in relation to the "*quality of democracy and democratic representation"* and the "*kindness and gentleness of their public policy orientations"*.[140] In particular, he concludes that consensus democracies have a better record with regard to protection of the environment, put fewer people in prison, are less likely to use the death penalty, and those in the developed world are more generous with their economic assistance to developing nations.

The implicit suggestion here *could* be that consensus democracies are generally more likely to perform well in relation to the social and environmental dimensions of climate change.

The ongoing political crisis in the Eurozone points to another possible dimension of change in relation to 'style of democratic politics'. If economic pressures generally, or resource scarcity in particular trigger major political crises, the 'style of democratic politics' that may emerge (to drive its own impacts in climate change and in democracy), could well be unstable coalitions; as in the case of the contemporary political crisis in Greece. And whilst the coalition governments of war-time, when strategic and political choices are brought into clear and stark relief, may on occasion be relatively stable (as in the case of the United Kingdom during the Second World War), those that emerge in response to economic or natural resource crisis may inherently be less stable,[141] with uncertain outcomes and implications for climate change.

Critical uncertainties

This driver of change is certainly associated with a high degree of uncertainty. But it is almost impossible to aggregate meaningfully across multiple locations. At the country level, we suggest that appropriate poles for the spectrum adopt Lijphart's language of 'consensual' and 'majoritarian' democracies. We might also speculate that members of the public are more likely to believe that there is value in public participation when they see consensual politics in play at the national level.

Public monitoring, transparency and accountability

Accountability is an important dimension both of governance and of democracy. David Keane places access to information, transparency and public monitoring at the heart of his theory of 'monitory democracy'. And for one commentator; Ann Florini; access to information is so significant as to provide an 'integral democratic principle'; with shifts in transparency providing the foundation for major shifts in patterns of governance.

It seems clear that the evolution of transparency and accountability, and *access* to transparency and accountability, are likely to be among the key determinants of our futures *as* democracies, of our futures *in* democracies, and the future of democracy itself.

In her book *The Coming Democracy*, Ann Florini argues that information technology and transparency are key to optimising the potential for a highly democratic (albeit non-electoral and imperfect) system of transnational governance. Transparency (and features that Keane might recognise as those of 'monitory democracy') is also a feature of the *Blueprints* scenario in the Shell Energy scenarios to 2050, in which local and city-level initiatives play a catalytic role, with growing transparency and grassroots pressure exerting a 'relentless' pressure on governments to become more accountable.

The drive towards transparency, like civil liberties more generally, is vulnerable to external shocks. Governments tend to seek to justify secrecy in the face of crisis. And whether climate change impacts themselves generate such crisis is among the major uncertainties in the relationship between democracy and climate change.

Relationship between organised religion and the state

It is commonly supposed that state and politics ought in principle to be separate from religion in a secular democracy. At the same time, as we showed in *Paper Three,* exceptions already abound. And there is also some evidence to suggest that people reach for organised religion, and faith, rather more in times of crisis than in good times.

Many commentators imagine that religion might also come to play an important role in democratic governments (and governance) of the future. A climate crisis, and the uncertainty that surrounds it, is likely to engender conflicting, rather than common, political ideologies. This in turn could lead governments to appeal to common religion as a means of retaining cohesiveness and authority. Samuel P. Huntington views the matter thus: *"Decreasingly able to mobilize support and form*

coalitions on the basis of ideology, governments and groups will increasingly attempt to mobilize support by appealing to common religion and civilization identity".[142]

Given the scope for global environmental crisis to trigger conflict (in the form of resource wars which cross national boundaries, for instance) appeals to the shared values of faith might form part of the responses.

The emergence of the information society could also carry wider implications for the role of religion in democracy. James Davison Hunter and James E. Hawdon consider the continuation of recent trends which have seen religious institutions and leaders being 'structurally displaced' by intellectuals, secular cultural elites and other sources of knowledge: *"where at one time there was little or no serious competition to define the symbols of public culture, there is now an overwhelming competition"*.[143] They argue that although religious elites and the institutions they serve might jostle for reintegration into the centre of public life, and into positions of real authority in the information society, they will be *"structurally hindered from actually pulling it off"* due to their position on the periphery of the knowledge sector. [144] It is arguable that their influence will become further diluted as new media and sources of information continue to emerge, providing competing definitions of the good life.

A protracted climate crisis might *itself* see shifting relationships between state and organised religion. Christian thinkers, for example, have made the case for democracy in terms that are difficult for people of other faiths to accept. Maritain (1882 – 1973) argued that *"[t]he democratic sense or feeling.. by its very nature, is an evangelical sense or feeling, its motive power is love, the essential thing in it is fraternity, it has its real sources in Gospel Inspiration"*.[145] Such views, which can sound sectarian, might increasingly be associated both with democracy and other political systems in times of crisis – or rather, with attempts to imbue democracy with moral values other than those associated simply with the notion that all people are equal.

Economy

Economic growth and the global economy

The political commitment to economic growth is closely linked to liberal democracy, as this paper and earlier papers in this project have argued. A commitment to delivering economic growth – whether at local or national level – is almost a foundational part of the political commitment of elected representatives in established democracies.

The *quality* of economic growth is also a key determinant of the environmental (and therefore social) impacts of human economic activity. But we should not forget that whatever the projections at country or regional levels, there remain large numbers of people around the world who are estranged from the formal (or even the informal money-based) economy, subsisting instead through barter or small-scale subsistence farming.

The IPCC's SRES Scenarios for global emissions make use of high, medium and low economic growth projections. These have been subject to some criticism, as discussed in *Paper Four*,[146] including those

that suggest that income gaps between poor and rich countries and (in part as a result) overall economic growth may have been exaggerated.

The flaws in economic growth projections suggest that caution is warranted in taking the SRES economic growth data as a basis for 'democracy and climate change' scenarios, even though there are solid grounds for concluding that *overall* the emissions projections in the SRES scenarios are broadly robust. However, data sets projecting global economic growth to 2100 are not only hard to come by, but likely to be almost meaningless outside the specific context in which they have been developed.

The IPCC also assesses the prospects for climate change mitigation in relation to 'market' and 'economic' potentials for mitigation (though not 'cultural' or 'behavioural' potentials). For these purposes, *market* potential is the mitigation potential which might be expected under forecast market conditions (including – in contrast to SRES scenarios for emissions projections – policies and measures currently in place). *Economic* potential is the mitigation potential taking into account social costs and benefits of mitigation – and assuming that market efficiency is improved by policies and measures. In most cases, the economic potential is therefore likely to be greater than the market potential.

Working Group III of the IPCC's Fourth Assessment Report concludes that there is substantial *economic* potential for mitigation of global emissions in the period to 2030, sufficient to "*offset the projected growth of global emissions or reduce emissions below current levels"*.[147] However, the political (and associated 'democracy') circumstances under which it might be possible to achieve that potential are not explored, beyond the recognition that barriers to implementation of mitigation options are manifold and varied.

By way of additional context for global economic growth, we can turn to consultancy PWC's *The World in 2050*.[148] The report, initially produced in 2006 and most recently revised in January 2011, sets out projections for potential growth in GDP in the G20 economies. It is limited territorially by virtue of the focus on twenty countries. The regional aggregation of the SRES scenarios also makes them of limited value at a highly disaggregated level. The report provides projections based both on purchasing power parity (PPP) and market exchange rate (MER). Methodologically, the report's projections see market exchange rates gradually converging with purchasing power parity-based GDP, though with the convergence factors depending on the type of economy.

Overall, *The World in 2050* notes that the largest emerging economies (the E7) are likely to be larger than the current G7 by 2020, measured on a PPP basis. And China *"seems likely to have overtaken the US by that date"*.[149] On the PPP basis, India too could overtake the US by 2050. By 2050, the E7 economies will *"by 2050 be around 64% larger than the current G7 when measured in dollar terms at market exchange rates.. or around twice as large in PPP terms.*" South Africa and Australia are projected to exit the top 20 rankings by 2050, with Nigeria and Vietnam entering (at 13th and 14th respectively) by 2050, assuming that *"they can continue to follow broadly growth-friendly policies"*.[150]

Taking GDP based on MER rates, the overtaking process is slower but 'equally inexorable'. The report notes that: *"[t]he Chinese economy would still be likely to be larger than that of the US before 2035 and the E7 would overtake the G7 before 2040. India would be clearly the third largest*

economy in the world by 2050, well ahead of Japan and not too far behind the US on this MER basis."[151] It seems 'highly likely' that China will emerge as the world's largest economy by 2040 on the basis of MERs (though the projection is subject to some significant uncertainty). And India is projected to achieve the most significant increases in share of world GDP on that basis. India's younger and faster growing working age population will provide the basis for India's trend growth to overtake China's trend growth during the coming decade (along with its starting point at a lower level of development). However, realisation of this potential is dependent on continuing to pursue growth-friendly economic policies. At MER rates, China, the US and India will account for some 50% of global GDP compared to the current figure of around 40%. By 2050, China is expected to be around 35% larger than the US at MERs by 2050 (around 57% larger in PPP terms).

PWC note that: *"[t]he broad conclusions reached on the shift in global economic power from the G7 to the E7 emerging economies should... be robust to... uncertainties, provided that there are no catastrophic shocks that derail the overall global economic development process".*[152]

Growth rates are also closely linked to the potential for mainstream liberal democracy to deliver on its promise, with economic growth too often a proxy for 'quality of life'.

Table 8 below reproduces PWC's model estimates.

Table 8: Projected real growth in GDP and its components of growth (2009-50)

Country	**Average annual real growth in GDP**	**Average annual population growth**	**Average annual GDP per capita growth**	**Average annual GDP growth From changes in MER**
Vietnam	8.8%	0.7%	6.1%	1.9%
India	8.1%	0.8%	5.3%	1.9%
Nigeria	7.9%	1.5%	5.0%	1.3%
China	5.9%	0.1%	4.6%	1.1%
Indonesia	5.8%	0.6%	4.1%	1.1%
Turkey	5.1%	0.6%	3.4%	1.0%
South Africa	5.0%	0.3%	3.6%	1.1%
Saudi Arabia	5.0%	1.4%	2.7%	0.9%
Argentina	4.9%	0.6%	3.0%	1.2%
Mexico	4.7%	0.5%	3.2%	1.1%
Brazil	4.4%	0.6%	3.3%	0.5%
Russia	4.0%	-0.7%	3.2%	1.4%

Korea	3.1%	-0.3%	2.6%	0.9%
Australia	2.4%	0.7%	1.9%	-0.2%
US	2.4%	0.6%	1.8%	0.0%
UK	2.3%	0.3%	2.0%	0.1%
Canada	2.2%	0.6%	1.7%	-0.1%
Spain	1.9%	0.1%	1.8%	0.1%
France	1.7%	0.2%	2.0%	-0.5%
Italy	1.4%	-0.2%	1.9%	-0.2%
Germany	1.3%	-0.3%	1.9%	-0.3%
Japan	1.0%	-0.5%	2.1%	-0.5%

Source: PwC model estimates[153]

Per capita income levels are also potentially a helpful pointer from our democracy perspective. Here, notwithstanding the country-level growth trends, progress is more gradual, as *Table 9* below shows.

Table 9 Relative GDP per capita levels in PPP terms (US=100)

	2009	**2030**	**2050**
US	100	100	100
Japan	71	78	79
Germany	79	80	82
UK	81	83	87
France	76	79	83
Italy	71	74	74
Canada	84	83	83
China	14	33	45
India	7	15	28
Brazil	22	31	41
Russia	42	67	74
Indonesia	9	16	22
Mexico	31	43	54
Turkey	30	43	57

Source: World Bank, PWC model estimates for 2050[154]

Against the largely linear trends played out in PWC's 2050 world, relatively short cycles of 'boom and bust' are well known. However, the current economically and psychologically depressed position of many of the world's richest states and the long 'tail' on events following the financial crisis of 2008 disrupts the feasibility of predictions.

It is clear, though, that the world is witnessing major shifts in global economic might, and a shift from the recent dominance of the West back to the historical dominance of the East. However, the overall character of the next few cycles of 'boom' and 'bust' (or 'rise' and 'fall') is made unusually uncertain by rapid increases in global population; humankind's dependence on technology in order to provide for its needs; and the impending shift in geopolitical lines, with a return to the historical significance of Asia as the world's economic powerhouse.

In the 1920s, Russian economist Kondratieff famously put forward his (controversial) theory that industrial economies (in effect, the global capitalist economy) follow cyclical patterns of liquidity which are in turn transmitted to prices, labour and production outputs.[155] These cycles or long waves, Kondratieff suggested, have, beginning in the late eighteenth century, reflected cycles of roughly 54 years, alternating between relatively high and relatively slow sectoral growth. The proposed fifty-four year period is simply an estimate, with cycles showing potential to expand and contract over periods of somewhere between 40-60 years.

Kondratieff's views do not represent economic orthodoxy (nor do they tally with Price Waterhouse Coopers' projections for the world's twenty largest economies to 2050, which do not show clearly cyclical or wave-formed activity). For example, some analysts point to the unique (unrepeatable) characteristics of each cycle; others to what they suggest is Kondratieff's selective deployment of historical facts and data to support his theory.[156]

Even so, the idea that there are 'long cycles' in the global economy offers a helpful device in principle for the ninety-year span of our scenarios. Most 'cycle theorists' would agree that the world has seen five waves since the industrial revolution and many would argue that the sixth is imminent. *Table 10* describes these waves in terms of Kondratieff's theory.

Table 10: Kondratieff's Five Waves

Cycle	1st Kondratieff	2nd Kondratieff	3rd Kondratieff	4th Kondratieff	5th Kondratieff
Period	1780-1830	1830-1880	1880-1930	1930-1970	1970 to today
Invention	Steam engine	Railway, steel	Electrification, chemicals	Automobiles, petrochemicals	Information technology, communications technology
Area of application	Clothing	Mass Transportation	Mass production	Individual mobility	Information and communication

Source: Allianz Global Investors, 2010[157]

Kondratieff saw each 'long cycle' beginning with technological innovations which fuel prolonged economic upturn, so long as the innovations permeate all sectors of the economy. A variation is proposed by Daniel Šmihula, who proposes a link between 'long economic waves' and *technological revolutions*. Each new wave is shorter than the previous; with new technologies decisive for long-term economic development.

Venezuelan academic Carlota Perez builds on Kondratieff's work (and more directly on that of Schumpeter) to propose a model of 'technology surges' in place of waves. Whilst the dates of each of five 'technological revolutions' since the late eighteenth century do not differ greatly from those proposed by other writers, Perez's surges focus on the processes through which technological

revolutions are propagated and assimilated within society. Whilst the precise application of either her or Kondratieff's model would imply a level of detail that is beyond this project, her description of 'surges' is more comfortably assimilated in our project, given its strong social, political and cultural dimensions. However, this approach suggests that there may be a strong interdependence between 'values' and 'technological innovation'; one that is not assumed to take any particular form in the *x* and *y* axes for our scenarios:

> *"A great surge is... defined as the process by which a technological revolution and its techno-economic paradigm propagate across the economy, leading to structural changes in production, distribution, communication and consumption, as well as to profound and qualitative social changes. Society, in turn, influences the path taken by the revolution. In other words, the concept stretches far beyond the economy, to encompass societal – even cultural – change."* [158]

Perez suggests that each surge begins with a 'big bang' (e.g. the invention of the microprocessor in the case of the most recent technological revolution) followed by a process of diffusion that is itself divided into installation and deployment phases. She argues that a financial crisis usually characterizes the final stage of installation (as with the dotcom bubble of the 1990s). The deployment period reflects the growing embededness of the recently established paradigm in all spheres of society, and in turn ends when the paradigm approaches exhaustion – at the end of a process that has also quietly seen the gestation of the next 'big bang'.

If there are strong links between economic cycles and technological innovation, as Kondratieff and Daniel Šmihula suggest, there are also significant implications for climate change. For with many of the world's economies in a depressed state, *and* with the next ten years or so immensely significant in determining the overall course of climate change, *and* whether collectively the world is able to avoid the most dangerous climate impacts, humankind is not at an optimal point to ensure that we can innovate our way, technologically, out of climate impacts.

On the other hand, David Holmgren argues that recession is the only proven mechanism for a decrease in greenhouse gas emissions and *"may now be the only real hope for maintaining the Earth in a habitable state"*.[159] Recession can buy more time to secure the societal and political innovations (at the systems level) that might be needed.

What, then, might fuel the sectoral growth of a next Kondratieff curve or technological surge?

Allianz Global Investors[160] draw a distinction between 'megatrends' that lead to shifts in *demand* (such as globalisation and demographics – themselves among the 'macro' drivers of change in greenhouse gas emissions) and trends and innovations that *"change the supply structure in the economy, such as environmental technology, biotechnology and nanotechnology or holistic health"*.[161]

They argue that the key to *"a strong and sustainable economy in the next long cycle seems to lie in an increase in the productivity of resources and energy"*. The environment, they conclude, is a hot candidate *"for a major role in the 6th Kondratieff cycle"*.[162] Sectors that are particularly important in terms of sustainable development consequently have strong potential. Equally, the connection of information technology to 'green markets' is likely to increase.

As to nanotechnology and biotechnology, Allianz argue that "*the area of very small structures, with the sectors of nanotechnology and biotechnology, is not yet capable of serving as a locomotive for the global economy. But in view of the high level of spending on research and development in this area, the major growth potential and the broad penetration of these interdisciplinary technologies, both of these fields may become megatrends and thus become drivers of the 6th Kondratieff."*[163]

Healthcare is the final sector highlighted as a technological driver of a 6th Kondratieff curve in Allianz's report. With global demographic change resulting in a changing and rising demand for health services, and progress in medical technology further extending lives:

> "*Health is now viewed less as a "condition" than as a resource and less as a cost factor than as a driver for economic growth and employment. As a result of this paradigm shift, the economic significance of the industry is expected to continue to grow".*[164]

Technological innovation is not the only correlation that can be made with 'long' economic cycles. Some analysts argue that cycles of global war are linked to long waves in the global capitalist economy.[165] Major wars, the argument goes, tend to begin just prior to an output upswing. Given current methods of accounting for economic growth and GDP, wars in turn tend to boost the economies of warmongering nations – but they destroy much more than they create.

Implications for democracy and climate change

Understood as drivers of change in democracy and climate change respectively, we have noted elsewhere in this paper the links between current mainstream economic growth patterns and greenhouse gas emissions. Economic growth is among the key drivers of change in the SRES scenarios applied by the Intergovernmental Panel on Climate Change. And whilst the notion of the 'green economy' is firmly on the agenda for the 2012 UN Conference on Sustainable Development, it seems very unlikely that major transformation and 'de-materialisation' of national economies let alone the global economy are likely to result.

Economic downturn and associated austerity can trigger major social unrest – amply demonstrated by protests in Greece in the wake of the sovereign debt crisis of 2011. And social disorder linked to economic downturn can make it even more difficult to allocate scarce public resources to climate change mitigation or adaptation; particularly when the impacts of climate change are likely to be felt at a distant future and by distant people.

Economic downturn, then, can amplify the short-termism of liberal democracy, even as it drives down greenhouse gas emissions. And it can also make it difficult for states that are *not* democracies to continue to deliver the material wealth to their populations on which their legitimacy (short of the threat of violence) tends to be founded.[166] Economic downturn, in other words, can destabilise both democracies and states that are *not* democracies.[167]

Economic interdependence

Economic globalisation – privatisation, deregulation and the gradual liberalisation of trade and investment – has made the world's nations deeply economically interdependent. Capital moves across borders to seek out the best returns on investment; sovereign wealth funds are invested in

other countries; sovereign debts are also traded across borders. It can now be difficult to assign a 'country of origin' to products because their components have been produced in so many different nations. In the early twenty-first century, more perhaps than ever before, the world is waking up to the implications of its own economic interdependence.

At times of instability nation states have shown that they have the potential to retreat into trade or investment protectionism. But there is a price to pay for such measures, for example in penalties under the terms of trade agreements or investment treaties.

The world's intergovernmental governance structures, rooted as they currently are in the idea of sovereign states as the key bargaining unit, have failed to catch up with the reality of economic interconnectedness and the ability of businesses to organise themselves transnationally.

Transnational regulation of the world's economy still exists principally, though not exclusively, to facilitate interdependence, rather than to regulate its negative impacts. Transnational regulation of international trade is overseen by one near-global body, the World Trade Organization, and a variety of regional trading blocs. In contrast, transnational regulation of direct investment has progressed principally (though not exclusively) through a series of bilateral and plurilateral agreements based on reciprocity of obligations to treat foreign and domestic investors broadly alike. Regulation of the environmental and social impacts of transnationally coordinated multinational corporations, meanwhile, has been piecemeal.

Economic interconnectedness exacerbates the challenges of governing climate change. And in an economically interconnected world, where the actions of individual governments impact on the competitiveness of their business's goods and services and investments on international markets, economic interdependence can also exert a chilling effect on the scope for regulatory leadership on environmental and social issues. At the same time, the environmental and social impacts (and costs) of international trade and investment are poorly factored into pricing structures; they are seen as being 'externalised'.

There is economic interdependence, too, in the speculative economy; the economy that is based on buying and selling of promises with only a distant connection to real things. The financial crisis from 2008, and the sovereign debt crisis of 2011 and beyond, amply demonstrate this.

If you add this economic interconnectedness (and consequently interdependence) to the global nature of climate change – where activities that generate greenhouse gas emissions in one part of the world can have an impact on lives and ecosystems distant both in time and in space – the basic democracy challenges of climate change mitigation and adaptation are brought to the fore and exacerbated.

In this world, raw economic indicators such as 'gross domestic product' and 'gross national product' are aspirational benchmarks of progress for governments. They serve as proxies for 'success', looked to by people as well as politicians in ways that can make it difficult for political processes to value, much less count, some of the key things that matter to overall human wellbeing or sustainable development. One response to this situation has been investment in alternative indicators. These

include, at the United Nations level, the Millennium Development Goals, adopted by the world leaders of the UN member nations in 2000 and which set eight goals for 2015 in order to tackle extreme poverty.[168] A variety of approaches have also tried to measure overall 'happiness' or 'wellbeing' and find ways to secure a place for such alternative indicators at the heart of public discourse.[169]

Alongside these approaches to 'valuing what matters' – which are based on indicators as well as including non-monetary ways of determining value to guide policy choices – the climate policy agenda has developed ways to attach economic value to greenhouse gases. The range of policy measures includes subsidies (e.g. for renewable energy investment), taxes on carbon-intensive activities, and a variety of emissions trading systems (sometimes referred to as cap and trade), where a cap is set on the total quantity of greenhouse gas emissions permissible, and a system for trading permits to emit those gases is created. The success of the trading scheme depends on the relative economic attractiveness to emitters of making investments to reduce emissions (so that no permit is needed) or alternatively continuing emissions whilst purchasing a permit at the prevailing market price. Its success is also crucially dependent on the level of the original cap.

Measures implemented by single countries, or small groups of countries, are naturally liable to have less impact in delivering greenhouse gas emissions reductions at scale. And there are also concerns about the impact of emissions trading schemes on the international competitiveness of goods covered by the schemes.[170]

There are other challenges in applying these kinds of economic instruments. Some types of subsidy and border tax adjustments which apply to internationally traded goods fall foul of the rules of the World Trade Organization. Emissions trading has shown itself vulnerable to fraud (as in the case of the world's largest emissions trading scheme; in the EU[171]). And at a time of economic downturn in Europe, the price of traded carbon is at a three-year low, with surplus credits accumulating to support future growth in emissions during economic recovery.[172] UK campaigning organisation Sandbag puts the dilemma the following way:

> *"the [European Emissions Trading Scheme] currently lacks any mechanism to reduce the supply of permits in the event of rapidly falling demand, and any permits unused during Phase II can be banked forward indefinitely across future Phases. That means that the 233 million spare emissions rights built up [in 2010] will be used to allow future emissions to take place".*[173]

A certain amount of economic interdependence is almost taken for granted in modern relatively liberalised economies. But there are also examples of populist political changes in recent history that are associated with a demand for protectionism, or the economic protection of natural resources for domestic use alone – Bolivia offers one recent example.[174]

In the 1970s, concerns about corporate abuses of economic power fed into broader developing country calls for a 'New International Economic Order' (NIEO); an idea promoted by post-colonial newly independent states and developing countries. Essentially, the NIEO reflected economic policy concerns and approaches held in common by a number of developing countries. The overall

dynamics of the NIEO debate were characterised by a North-South divide on issues such as commodities trade, debt, industrial development and technology transfer. Rather than interdependent cooperation among nations, a key priority was to enshrine the right to the full and independent expression of territorial sovereignty. So too was the right of developing countries to control fully the activities of multinational corporations in their territories.

In a global context in which valuable (traded) natural resources – such as fossil fuels – are increasingly scarce, there may be significant pressures to roll back economic interconnectedness through measures that are often pejoratively referred to as 'resource nationalism'. It is perhaps helpful to think of three distinct forms this could take: the resource nationalism of producer countries (in which producer countries increase control of economic activity in their natural resource sectors); consumer country resource nationalism (in which consumer countries seek to gain greater control or increased access to natural resources in other countries), and a relatively new form of 'resource nationalism', namely the nationalism of countries whose territories are a target for investment by sovereign wealth funds derived from natural resource revenues.[175]

The most commonly-discussed form of resource nationalism is that of producer countries. Here, the central accusation is that governments of natural resource-rich countries insist on governing natural resources, or doing deals, in a way that places national interests – or national political interests – significantly above established good practice norms for doing business with investors in a partially liberalised global economy.

We might expect in the future, as peak oil, gas and potentially coal, land and water (Richard Heinberg's 'peak everything') become a widely-recognised reality, that we will see many more government measures that go against the grain of a liberal, interconnected global economy in order to advance national, or local, strategic interests. *Box 5* below highlights some of the policy tools associated with resource nationalism in producer countries.

Some of the problems thrown up by economic interconnectedness – particularly its tendency to 'externalise' social and environmental costs (and benefits) in both time and space – are also reflected in widespread use of economic cost benefit analysis of policy and projects. In turn, the fact that those norms are applied through a relatively 'globalised' (or at least interconnected) discipline – economics – can make it difficult for one nation to go it alone with a different approach; one that might potentially chime better with both democracy and with the imperative to mitigate and adapt to climate change.

The significant substantive differences between different methods of economic analysis are revealed in Dietz and Neumayer's work contrasting the outcomes of the environmental economics processes used in the Copenhagen Consensus[176] and the Stern Review on the Economics of Climate Change[177]. The former ranked policy problems and associated remedies for a list of seventeen environmental and development problems. Those associated with three climate change problems were ranked lowest in the exercise. The methodology was based on monetisation of the "net benefits" of each proposal.

Box 5: The policy tools of resource nationalism

- Renegotiation or cancellation of existing natural resource contracts
- Rejection of particular kinds of governance frameworks considered less favourable to producer countries
- Nationalisation
- Outright prohibition on international oil company production or increasingly stringent demands for national shares in natural resource joint ventures or for regulatory scrutiny and prior approval of commercial disposals or acquisitions in the natural resource sectors
- Rapid increases in taxes payable by natural resource companies in times of high commodity prices
- Stringent and mandatory regulation of local content
- Restrictions on exports of natural resource products (e.g. Vietnamese, Indian, Egyptian and Cambodian restrictions on rice exports linked to rapidly rising food prices)
- Reservation of specified quantities of natural resources on grounds of national security or food or energy security
- Measures for 'domestication' of key sectors
- Requirements for investors to make increasing contributions to direct social spending by executing infrastructure projects, or investing in a variety of social investment projects in localities, or at the national level where they invest.

Source: Halina Ward, Resource Nationalism and Sustainable Development, 2009[178]

In contrast, the Stern Review[179] took a broader methodological approach and arrived at the conclusion that greenhouse gas emission reductions *should* be a global policy priority. One important distinction between the two analyses concerned the 'discount rate' applied when considering the costs and benefits of greenhouse gas emission reduction into the future. Generally a discount rate is set to reflect market interest rates, but Nick Stern applied a lower discount rate (1.5%) in the interests of intergenerational fairness.

When economic reasoning is underpinned by worldviews or assumptions that have significant implications for global challenges such as climate change, 'democratisation' to ensure more accessible public discussion for those who want to engage seems an imperative. We also need to consider the implications of conventional economic analysis and reasoning for decision-making in the economic policy realm (for example in relation to infrastructure or extractive industry projects) particularly when investments have profound impacts for natural resource use and the maintenance of natural capital.

Whether democracy itself will evolve to deliver the underpinning for effective citizen engagement in economic analysis and to enable future generations to play a more significant role in setting its

overall boundaries is one of the most significant uncertainties associated with this driver of change; particularly as decisions are increasingly reached in climate-constrained circumstances.

Whether the world's economies retreat from current levels of economic interconnectedness and shift towards protectionist or 'resource nationalist' measures is another significant source of uncertainty (itself closely linked to Shell's *Scramble* and *Blueprints* scenarios). And whether economic instruments such as carbon trading schemes achieve their promise is heavily dependent on the price of greenhouse gas emissions permits and, in turn, the readiness of policy-makers to adjust caps to changing circumstances to achieve overall targets.

Role of business

It is businesses who will deliver many of the changes that are identified elsewhere in this report: from the 'smart cities' and infrastructure grids of the future, to the potential future geoengineering and environmental technology solutions that could accelerate adaptation and mitigation of climate change. They may also provide 'nudges' to responsibility or sustainability as progressive corporate brands attempt to change consumer behaviour.[180]

Business, as an economic actor, is also potentially among the major drivers both of democracy and of climate change. Businesses are only rarely enfranchised in the context of representative democracies.[181] And yet the close links between liberal democracy and economic liberalism mean that elected representatives, from national to local levels, all too often behave as though businesses are the voters to whom they are accountable rather than simply stakeholders (that is, organisations with 'an interest').

Businesses are therefore mostly unenfranchised yet often powerful. From illegal corrupt payments by businesses to policies designed to protect business interests; from the activities and impacts of paid lobbyists to links between politicians and the world's media conglomerates; businesses have a major impact on the course of democracy. More than that, it is often suggested that the annual turnover of the world's largest multinational corporations is larger than the GDP of many nations. One implication is that economic power carries political power.

When business impact on elected representatives is not transparent or determines how elected representatives serve those who have elected them, it undermines democracy (understood as 'rule by the people, for the people'). But businesses can also serve the needs of society. Some larger enterprises have begun to think longer-term (rather than only for the short-term needs of their shareholders) as part of their commitment to sustainable development or to corporate social responsibility.

Without forgetting that a majority of the world's enterprises are so-called SMEs (small and medium-sized enterprises) or micro-enterprises, the role of business in democracy is deeply contested. How it could evolve for the future depends in part on the *purpose* of business and whether, in regulating and controlling how businesses pursue their purpose, the role of governments is to ensure that those purposes *directly* serve the public interest. And in part, how it evolves depends on how businesses manage their *own* purpose.

There are plenty of ways in which some businesses *already* serve public interests that are compatible with sustainable development; by providing 'green and fair' jobs for people; by constituting themselves as enterprises pursuing a social purpose; or by adapting their business models so as to ensure that their products and services serve the most pressing societal needs. But there remains a major question about whether, without intervention to ensure that businesses *directly* pursue goals that are supportive of societal goals associated with sustainable development (or, for our purposes, effective mitigation of and adaptation to climate change), business will be a net driver of change for the better when it comes to the relationship between democracy and climate change.

We have chosen the descriptors 'vested economic interests dictate' and 'in service to social/political goals' as the end points of our axis for this driver. A democracy in which the role of business is simply to advocate for its own vested economic interests – in an untransparent manner, or over and above any wider political or societal goals – is likely to be unhealthy for so long as elected representatives behave as though their role is to serve those interests. At the other end of the axis is the idea of harnessing business activity directly to serve social, environmental, and democratically determined policy goals. This is encapsulated in the vision of Corporation2020, a forum designed to create a vision for the Future Corporation. Principle 1 of the initiative's Principles for Corporate Design is that *"[t]he purpose of the corporation is to harness private interests to serve the public interest"*. We aim to capture the spirit of this Principle in our axis. And the complete set of Principles for Corporate Design might usefully be adopted as a positive vision for the corporation of 2050 (or sooner). We reproduce them in *Box 6* below.

Box 6: The 2020 Corporation

1. The purpose of the corporation is to harness private interests to serve the public interest.

2. Corporations shall accrue fair returns for shareholders, but not at the expense of the legitimate interests of other stakeholders.

3. Corporations shall operate sustainably, meeting the needs of the present generation without compromising the ability of future generations to meet their needs.

4. Corporations shall distribute their wealth equitably among those who contribute to its creation.

5. Corporations shall be governed in a manner that is participatory, transparent, ethical, and accountable.

6. Corporations shall not infringe on the right of natural persons to govern themselves, nor infringe on other universal human rights.

Source: http://www.corporation2020.org/

In many respects, the course taken by this driver of change lies at the heart of solutions to one of the core problems in the relationship between democracy and climate change; namely the close links between economic liberalism and liberal democracy.

At the time of writing, the sovereign debt crisis in the Eurozone is upstaging (for the time being at least) the 2008 financial crisis: the role of markets, and of the businesses within those markets, as

determinants of the course of democracy has not been so evident at any time in Western living memory.

Businesses are too often *disruptors* of democracy. Unless the link between state, or government, and market, can be broken; through citizen revolt, radically different accountability mechanisms securing greater public oversight, or deep economic or environmental crisis; they may continue to be so. We should not be slow to mention, either, that businesses always have people, with all their diverse values and beliefs behind them. The transformation of business into a force for public good may in part therefore depend on transformation in widely held human values.

Preparations for the 2012 UN Conference on Sustainable Development feature discussion on the idea of the 'green economy'; but with the economies of many of the world's richest nations in disarray, there is a risk that little more than 'slightly greened business as usual' will result. The massive impact of business – particularly the financial sector – on the course of democracy in Europe is becoming rapidly and painfully apparent in new ways. For example, we might think about UK austerity measures, the downgrading of the creditworthiness of the United States; proposals for a coalition government of unity in Greece to struggle against economic, financial and social crisis; or the non-elected government of technocrats in Italy; made democratic principally through support received from Parliament.

It is important not to see *all* business as monolithic, however. To the extent that technological innovation plays a major role in delivering solutions to the mitigation and adaptation challenges of climate change, business innovation may be centrally important (bar mass nationalisations or climate innovation investment by public agencies on a huge scale – currently principally limited to China). Investment in clean technology; in industrial processes that minimise greenhouse gas emissions; and in goods and services that meet peoples' needs; can all be accommodated within 'business as usual' economic models. The signs are that external drivers including new public regulation and higher energy and food prices could spur further development of business activity in this direction.

At the same time, for other businesses, economic downturn or high energy prices make responsible business behaviour more vulnerable. Economic recession creates a risk of greater short-termism in business as well as government.

More challenging trends and directions are also emerging that could trigger deeper reflection on the role of business in society as a whole – and therefore its impact on democracy and on climate change. Four are worth mentioning here:[182]

- The emergence of an increasingly visible emphasis – in Europe at least – on the economic dimensions of business behaviour. Examples include taxation of multinational corporations; regulation of investment contracts; taxation and regulation of high pay and bonuses.
- Business models that are unfamiliar in contemporary Western capitalism are increasingly economically prominent. This is exemplified by the closely state-sponsored approach taken by Chinese natural resource companies as they seek access to natural resources in Africa, and by a rise in the overall economic significance of publicly-owned or controlled oil and gas

companies. A rise in transnational competition for natural resources in which a significant group of actors operate to different 'rules of the game' carries significant implications for the relationship between states and 'their' businesses. When seen alongside massive state bailouts of banks by governments in some European and North American states, there is a strong case for arguing that the contours of the relationship between state and market are undergoing changing.

- There are 'weak signals' of renewed interest in the impact of business activity on public governance and democratic decision-making; for example through work exploring the boundaries of legitimate business engagement in public policy – and no doubt for the immediate future 'stronger signals' of interest in exploring further that relationship in the wake of the Euro Zone crisis.
- The role of business leadership (or lack of it) on climate change, where global business leaders are beginning to step up their advocacy in support of an effective global climate regime. At the same time, there is also continuing evidence of strong business lobbying, and government support, for less climate-progressive businesses who demand that the priority at a time of economic and political crisis must be to return economies to 'business as usual' patterns of economic growth.

So one set of outcomes might be 'business as usual'; with the idea of responsible business behaviour continuing to form an imperfect bridge between public governance of markets and social outcomes. Capitalism would then remain fundamentally unquestioned, with businesses investing in climate change adaptation and mitigation only to the extent that it is commercially viable to do so.

Another set of outcomes would be 'unusual business', in which more challenging responses (such as the four highlighted above) gain ground, and debate about the role of business in society pushes more businesses in the direction of sustainable development and a positive and fully transparent contribution to public governance.

Environment

Planetary boundaries and ecosystem services

The health of the natural environment – and the availability of natural resources sufficient to meet basic human needs – are significant drivers of societal change. They will impact on democracy because of their possible disruptive effect in throwing up hard-to-fix intractable political challenges that demand rapid responses – for example through high food prices or water shortages. They may exacerbate social tensions and the demands on democracies to tackle societal inequalities, even as growing inequality drives further alienation from the formal processes of representative democracy. In this sense, ecosystem stresses could be similar in impact to climate change itself. And they could contribute as drivers of climate change and greenhouse gas emissions, for example, through changes in land use and the health of the world's oceans, or processes of deforestation.

In *Paper Two* we addressed the future trajectory of the world's ecosystems through the lens of the 2005 Millennium Ecosystem Assessment (MEA); which itself predates the Intergovernmental Panel

on Climate Change's Fourth Assessment Report. The MEA worked to develop scenarios for the year 2045 (close to the 2050 staging-post for our own project). Whilst its underlying data is now six years old, its comprehensive nature justifies its inclusion here.

A number of the MEA's analytical conclusions on underlying drivers of change reveal some of the interplays across the drivers that are relevant in our own project, including growth in population and per capita income.

In addition:

- A further 10-20% of grassland and forestland is projected to be converted to cultivated uses by 2050

- Ecosystem pressures as a result of overfishing and excessive exploitation of natural resources are set to grow

- Invasive alien species are set to continue to spread

- Disruption is set to occur in the natural nitrogen cycle. Flows of reactive nitrogen could increase by roughly a further two thirds by 2050, generating a wide range of negative health and environmental impacts. These could contribute to global warming. The impacts could also include widespread eutrophication of freshwater and coastal ecosystems; loss of biodiversity; increased risk of cancer and other chronic diseases from nitrate in drinking water; increased risk of asthma and a variety of pulmonary and cardiac diseases from fine particles in the atmosphere.[183]

The MEA also addresses the impacts of climate change. Whilst in our scenarios, climate change is an area of *impact* rather than a driver in and of itself, it is worth noting that, by the end of the end of the century, the Report suggests that *"climate change and its impacts may be the dominant direct driver of biodiversity loss and changes in ecosystem services globally"*.[184]

A range of other overarching 'framing' projections are identified in the Millennium Assessment which provide insights that are directly relevant for our project. They include the following:

- Demand for food crops is projected to grow by 70-85% by 2050, and water withdrawals by 30-85%

- Food security will not be achieved by 2050, and child under-nutrition will be difficult to eradicate (and is projected to increase in some regions in some Assessment scenarios)

- Whilst global water availability increases under all Millennium Assessment scenarios by between 5-7% by 2050 (depending on the scenario), demand for water is projected to grow by between 30% and 85%[185]

The four scenarios developed within the MEA project show progress in tackling hunger but at rates far slower than needed to attain the globally agreed Millennium Development Goal target of halving the proportion of people who suffer from hunger by 2015. The Millennium Assessment suggests that

improvements are likely to be slowest in those regions in which the problems are greatest: South Asia and sub-Saharan Africa.

If the world's ecosystems are in decline, what concepts might environmental (or earth systems) thinking and science be associated with, that could emerge hand in hand with these environmental drivers of change?

UK sustainable development leader Peter Madden, writing in November 2011, considers that *"ecosystems are the new climate change. As the population grows and the science gets scarier, there is increasing attention on the basic services the planet provides to us, from clean water to raw materials in the supply chain".* A major international study, *The Economics of Ecosystems and Biodiversity*,[186] has been designed to put a value on these natural services, so that they can be adequately factored into policy processes and decision-making.

A second concept that is rapidly gaining currency is the notion that there are 'planetary boundaries'. Launched by 29 scientists led by Johann Rockström in 2009, the proposal is for *"a new approach to global sustainability in which we define planetary boundaries within which we expect that humanity can operate safely. Transgressing one or more planetary boundaries may be deleterious or even catastrophic due to the risk of crossing thresholds that will trigger non-linear, abrupt environmental change within continental- to planetary-scale systems".*[187]

The scientists argue in a seminal paper published in the journal *Nature* that there are nine non-negotiable Earth-system processes and associated thresholds that we need to respect and keep within to secure a safe operating space for humanity. The authors argue that three of the seven suggested quantified thresholds associated with the nine planetary boundaries have already been crossed (for climate change, biodiversity and the nitrogen cycle).[188] The remaining six boundaries relate to ocean acidification, chemicals dispersion, stratospheric ozone, the phosphorous cycle, global freshwater use and land system change.

Whether the idea of 'ecosystem services', which is associated with the idea of placing a numeric (and hence *economic* value on the services that nature provides); or the cognitively (and scientifically) quite distinct idea of 'planetary boundaries' shape the coming forty years is highly uncertain.

On the one hand, the idea that earth systems provide 'ecosystem services' clearly runs with the grain of existing economic logic and offers a politically attractive framing for the world's environmental (and ecosystem) challenges. In contrast, the idea of 'planetary boundaries' and 'environmental limits' can be harder for elected representatives to swallow as long as they seek to maximise welfare or meet basic human needs in the short-term. At the same time, however, the speed with which the idea of 'planetary boundaries' has taken hold in at least some scientific and policy circles, and its power to communicate some very basic dilemmas about the impact of human activities, suggest that at the very least a vibrant 'counter culture' will emerge to advocate for legal and policy recognition of this notion.

Already, a Planetary Boundaries Initiative has been formed, with one of its activities being the promotion of a Draft Declaration on Planetary Boundaries in the process leading to the United Nations Conference on Sustainable Development (UNCSD). The idea of planetary boundaries also looks set to receive prominent attention in the forthcoming report of the High Level Panel on Global Sustainability,[189] and it features (in a variety of forms) in submissions from a number of middle and low-income countries that are designed to inform the so-called 'zero draft' of the political outcome from the UNCSD.[190] Embryonic work is also under way to explore whether there are 'social boundaries' that could act as a 'floor' alongside 'environmental limits'.[191]

If these concepts offer the basis for a competition of policy ideas (and not a mutually exclusive one at that), they also have the potential to impact both on democracy and on climate change. The idea of ecosystem services plays well with a system of democracy based on 'enlightened self-interest', in which environmental services are accorded the (monetary) value that (it might be argued) they properly deserve within the policy process. Full policy and legal implementation of the idea of planetary boundaries, and the associated ideas of constraint and of a 'safe operating space' for humanity might necessarily mean more radical changes in the lives and lifestyles of many millions of people around the world. The actual health of ecosystems could drive the further development of either concept.

Energy demand and fossil fuel supply

Demand

Against a backdrop of rising population, propelled by the rapid growth of economies like China and India, it is hardly surprising that rates of energy consumption are set to increase dramatically. The International Energy Agency's (IEA) *2008 World Energy Outlook* report (the most recent of this series of reports available in full to us at the time of writing)[192] suggests that in a business-as-usual *Current Policies Scenario* (based on an assumption that policies remain as they were in mid 2011), the world's primary energy demand will grow by 1.6% per year, and by 45% in total between 2006 and 2030.

Alongside an overall increase in global energy demand, the IEA projects shifts in the global *distribution* of energy demand changing in the period 2006-2030. Due to rapid economic growth, it is envisaged that China and India will account for 51% of the incremental primary energy demand under the IEA's Reference Scenario; and the Middle East, an emerging demand centre, a further 11%. The IEA projects that non-OECD countries will contribute 87% of the increase in global energy demand by 2030. As a result, these countries' combined share of world primary energy demand will rise from 51% to 62%.

Aggravating this increasing demand for fossil fuels, particularly in the world's emerging economies, is the reality that oil, gas and coal supplies are expected to decline markedly over the course of this century. The US Army Corps of Engineers foresees a series of depletion events, beginning with oil over the next five years, followed by natural gas in the next twenty, and coal by 2100.[193] However, the jury is still out regarding the precise timings of these fuel peaks and declines.

As far as we can know, then, what are the projected fates of oil, gas and coal stocks in the 21st century? And how might a shifting balance of energy supply and demand interact with the related, yet distinct, challenge of climate change?

Fossil Fuels

Oil

The future of the planet's oil is a hotly-contested topic. The IEA projects a significant increase in global oil production from 8 million barrels per day (mb/d in 2007 to 106 mb/d in 2030), and states that total global oil production is not expected to peak before 2030. However, many scientists and oil industry experts believe that global oil production has already peaked and is now in decline (see *Box 7* below on Peak oil). As oil giant Shell puts it, *even if* it were possible for fossil fuels to maintain their current share of the energy mix, CO_2 emissions would be on a pathway that could severely threaten human well-being.[194]

Box 7: Peak oil

Although the term '*peak oil*' has only recently entered the mainstream, the concept dates back to the work of Marion King Hubbert in 1956.[195] This work generated the famous Hubbert Curve; a roughly symmetrical logistic distribution curve illustrating the production rate of a limited resource. Based on the observed production rates of individual oil wells, Hubbert showed that over time the production rate usually grows exponentially until the rate peaks and then declines until the resource is depleted.

Peak oil is the inevitable outcome of Hubbert's principles, when applied at the global scale. It occurs when global oil production reaches its maximum capacity, at or around the point at which 50% of the Earth's total oil reserves are depleted. Following the peak, production inevitably declines, with available oil becoming increasingly expensive and difficult to produce.

Initial versions of the Hubbert curve for global oil production indicated that it would start to decline around the year 2000. However, forecasts from geologists and oil industry experts in the last five years have foreseen production peaking between 2005 and 2013. Even more recently, the growing consensus is that peak oil was actually reached at some point between 2005 and 2008. The 2008 financial crisis and its aftermath reduced investment in new oil production capacity, preventing 2008 production levels from being sustained.[196] But the precise date of the peak remains contested, with some analysts envisaging that advances in exploration, extraction and processing technologies could push peak supply further towards 2030.[197] Whichever is the case, it is reasonably clear that 'peak oil' will occur before the 2050 cut-off for our first set of scenarios.

The societal impacts of peak oil are manifold. Hirsch *et al* state that since oil is the lifeblood of modern industrialised civilisation, "*[t]he peaking of world oil production presents... the world with an unprecedented risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social and political costs will be unprecedented"*.[198] As to the specifics of those 'costs' there is great uncertainty given the novelty of the peak oil problem: as the Hirsch Report goes on to state, "*past 'energy crisis' experience will provide relatively little guidance"*.[199]

The IEA's 2008 Reference Scenario also forecasts that global *demand* for oil will rise by an average of 1% per year until 2030. This represents a downward revision in recent estimates, owing to the impact of higher oil prices and slower GDP growth. The IEA envisages that all of the projected increase in global oil demand will come from non-OECD countries – predominantly China, India and the Middle East.

An additional oil output capacity of almost six times the output capacity of Saudi Arabia in 2008 (64 mb/d) would be necessary between 2007 and 2030 in order to fuel the IEA's projected rise in global oil demand. The IEA warns that the immediate risk to the supply of oil is not linked to a lack of oil stocks, but rather to the lack of *investment* in cheap reserves, particularly in the lowest-cost countries.

Gas

The demand for natural gas is also widely believed to be set to rise. The IEA envisages that global demand for natural gas will rise much more sharply than demand for oil – by 1.8% per year until 2030. According to the IEA's *2008 World Energy Outlook* report, between 2006 and 2030 *"[o]ver a quarter of the growth in world gas demand comes from the Middle East"*.[200]

The production of natural gas is also set to increase under the IEA's Reference Scenario. As in the case of gas *demand*, future gas *supply* will likely see the Middle East as a key player. The IEA projects that 46% of the growth in world gas production will come from the Middle East, with that region's output tripling by 2030. Most of the remaining increase is likely to be provided by Russia and Africa. Gas production in fuel-rich sub-Saharan African countries is thought to be set to increase at least four-fold, from 36 billion cubic metres (bcm) in 2006 to 163 bcm in 2030.

While the IEA points to increase in both gas supply and demand, other commentators are less optimistic regarding supply. For example, Richard Heinberg warns that *"as with oil, production forecasts by the official agencies for natural gas have tended to be overly robust. For example, in the US the EIA issued no warning whatever of future domestic natural gas problems prior to the supply shortfalls that became painfully apparent after 2000, as prices more than quadrupled"*.[201] Heinberg argues that even if the peak in global gas production is a relatively comfortable 10 to 20 years away, *"regional shortages are already appearing and will continue to intensify"*. Ahmed highlights the fact that Canadian gas reserves have been declining for decades, and that Europe could face a gas supply crunch due to the difficulties facing Gazprom (the Russian superpower, which controls the world's largest gas reserves) in maintaining current supply levels.[202]

Given the predominantly regional trading of natural gas (relative to liquid fuels which can be shipped more easily), the regional depletion of reserves could well prove more important to national democracies than the global picture. It is likely that Canada, the USA, Britain, and much of continental Europe will increasingly have to engage in the international trade of natural gas, and will certainly not be in a position to rely on gas as a potential 'transition fuel'.[203]

Coal

Coal is often considered to be an abundant fossil fuel. One widely accepted view, endorsed by the World Coal Association, is that global coal supplies will last another 119 years.[204] It is this that has encouraged investment in 'clean coal' (a technology promising to remove the dangerous emissions

associated with burning coal) as an alternative to conventional coal. However, technology such as this is useless if, as some argue, there is insufficient coal to meet projected demand.

Reports by the Energy Watch Group[205] and others warn that based on updated reserve and production forecasts, global coal production could peak at around 2025; at 30% above 2007 production levels.

The most rapid depletion of reserves is occurring in China and the USA. And although remaining volumes of coal are not insignificant, EWG believes that high-quality coal production in the USA has already peaked (in 2002), so that current and future production will need to rely more on lower quality (sub-bitumous coal). The group estimates that US coal production, based purely on energy content, will only be able to maintain current levels for another 10-15 years. While contributions from reserves in Australia, China, Russia, Ukraine, Kazakhstan and South Africa might allow for a temporary increase in global coal production, this too is predicted to plateau soon after 2020.

Despite the growing realisation that coal stocks are not as plentiful as they were once believed to be, the IEA's *2008 World Energy Outlook* warns that between 2006 and 2030 demand for coal will increase more than *"demand for any other fuel in absolute terms"*, by an average of 2% per year,[206] and that its share in global energy demand will climb from 26% in 2006 to 29% in 2030.

Future trajectories of oil, gas and coal supply and consumption make Heinberg's synopsis of the global energy situation particularly apt: "*[W]e are today living at the end of the period of greatest material abundance in human history – an abundance based on temporary sources of cheap energy that made all else possible. Now that the most important of those sources are entering their inevitable sunset phase, we are at the beginning of a period of overall societal contraction*."[207]

Renewable energy

At some point, long before 2050, global production of both oil and gas will peak and subsequently decline. Production of coal may also have peaked before 2050. The impacts of these peaks will depend partly on overall demand patterns, and partly on who has control of the remaining resources in the period after the peak.

In reality, any new investments to support a shift to a non fossil-fuel-based infrastructure will need to be made over the next few years if dangerous climate change is to be averted. In its recently-published *World Energy Outlook 2011*, the International Energy Agency warns that the world is already producing about 80% of the total 2035 emissions budget required to keep global warming to no more than two degrees Celsius above industrial levels. If current trends were to continue, with new investment in carbon-intensive infrastructure, 90% of the budget would be used up by 2015, and there would be no room for manoeuvre by 2017,[208]with the implication that after that date *all* new infrastructure would need to be zero carbon; an extremely costly scenario.[209] An article on the report in the UK Guardian newspaper warns starkly that:

> *"The world is likely to build so many fossil-fuelled power stations, energy-guzzling factories and inefficient buildings in the next five years that it will become impossible to hold global warming to safe levels, and the last chance of combating dangerous climate change will be 'lost for ever'...*

> *Anything built from now on that produces carbon will do so for decades, and this 'lock-in' effect will be the single factor most likely to produce irreversible climate change, the world's foremost authority on energy economics has found. If this is not rapidly changed within the next five years, the results are likely to be disastrous".*

Nuclear energy based on fission provides one important alternative to energy futures based on fossil fuels. But as the 2011 Japanese Fukushima nuclear power plant disaster shows, it is one fraught with dangers to human and plant life.

It may be difficult in the immediately foreseeable future for politicians to resist the potential for nuclear power, particularly those in many of the economically struggling countries of Europe who also face pressures to develop short-term fixes to the social justice and economic problems of high fuel prices, ageing power infrastructure and the major political challenges of climate change.

In May 2011, in the aftermath of the Fukushima power plant disaster, Germany's coalition government announced that all new nuclear power plants would close by 2022, despite the fact that nuclear energy currently meets almost a quarter of Germany's energy needs.[210] Germany's seven oldest reactors, which had been taken offline immediately after the Fukushima disaster, will never be brought back into service. Ten more are also due to go offline by 2022.

The effect of Germany's announcement could be massive pressure for new coal-field development alongside further investment in wind energy. Not many industrialised governments have reacted in this way following the Fukushima disaster (though the Swiss government had also announced in May 2011 that it would not replace the country's five ageing nuclear power plants after they reached the end of their lifetimes[211]). Even so, any new nuclear disasters would reinforce political pressures to move away from nuclear energy.

Aside from the risks of radiation leaks during the life of nuclear power plants, there are also difficult choices about disposal of nuclear waste. The legacy of nuclear power lasts for many tens of thousands of years. Danish documentary *Into Eternity*,[212] released in 2010, focuses on the world's first permanent radioactive nuclear waste storage repository, Onkalo, in Finland, which must be designed to last 100,000 years. Can policy-makers and engineers ever guarantee safety over such a time-scale, the film asks? How can they hope meaningfully to signal what lies within to anyone, or anything, that wants to know 90 or 100000 years hence?

Nuclear energy aside, international non-governmental organisation WWF argues, based on analysis by energy consultancy Ecofys, that it is technically '100% possible' that by 2050 the world could meet 95% its energy needs from renewable energy resources. In such a scenario, only the existing built-in impacts of climate change would potentially arise; though even these might make for the impacts associated with an *additional* warming of around 1° C over pre-industrial levels; already around 0.74°C.[213] This is already close to the 2° C that is widely considered to be the dividing line between dangerous and extremely dangerous climate change.[214] Some impact on democracy might therefore be anticipated even in WWF's 'best case' (and far from probable) scenario of 95% renewable energy by 2050.

Under the Ecofys scenario, fossil fuels, nuclear power and traditional biomass are almost completely phased out by 2050, replaced by a mix of renewable energy sources: solar, wind, ocean, hydropower and geothermal energy provide the new mix, together with some biomass (including algal biomass, for example). The scenario, summarised in *Box 8* below, is grounded in a 2050 energy demand 15 percent lower than in 2005. Ecofys argues that reliance on fossil fuels could be reduced by 70% by 2040 – though the pace of change is currently far too slow. An additional 1,000,000 onshore and 100,000 offshore wind turbines would meet a quarter of the world's electricity needs by 2050 under the Ecofys scenario, and more than a third of building heat could come from geothermal sources by 2050.

The nature of the challenges that will need to be overcome to achieve this desirable goal is evident from the scenario summary itself; but the true scale of the task that lies ahead can be gauged from recommendations on the measures that will need to be taken if the scenario is to be realised (see *Box 9*).

Box 8: The WWF/Ecofys Scenario for 95% renewable energy by 2050

Although population, industrial output, passenger travel and freight transport continue to rise as predicted, ambitious energy-saving measures allow us to do more with less. Industry uses more recycled and energy-efficient materials, buildings are constructed or upgraded to need minimal energy for heating and cooling, and there is a shift to more efficient forms of transport.

As far as possible, we use electrical energy rather than solid and liquid fuels. Wind, solar, biomass and hydropower are the main sources of electricity, with solar and geothermal sources, as well as heat pumps providing a large share of heat for buildings and industry. Because supplies of wind and solar power vary, "smart" electricity grids have been developed to store and deliver energy more efficiently.

Bioenergy (liquid biofuels and solid biomass) is used as a last resort where other renewable energy sources are not viable – primarily in providing fuels for aeroplanes, ships and trucks, and in industrial processes that require very high temperatures. We can meet part of this demand from waste products, but it would still be necessary to growth sustainable biofuel crops and take more wood from well-managed forests to meet demand. Careful land-use planning and better international cooperation and governance are essential to ensure we do this without threatening food and water supplies or biodiversity, or increasing atmospheric carbon.

By 2050, we save nearly Euro4 trillion per year through energy efficiency and reduced fuel costs compared to a 'business-as-usual' scenario. But big increases in capital expenditure are needed first – to install renewable energy-generating capacity on a massive scale, modernize electricity grids, transform goods and public transport and improve the energy efficiency of our existing buildings. Our investments begin to pay off around 2040, when the savings start to outweigh the costs. If oil prices rise faster than predicted, and if we factor in the costs of climate change and the impact of fossil fuels on public health, the pay-off occurs much earlier

Source: WWF, Ecofys, OMA, The Energy Report: 100% renewable energy by 2050[215]

Box 9: Policy measures and recommendations for a 95% renewables future in 2050

1. Clean energy. Promote only the most efficient products. Introduce legally binding minimum efficiency standards worldwide for all energy-consuming products, including buildings. Develop existing and new energy sources to provide enough clean energy for all by 2050.

2. Grids. Share and exchange clean energy through grids and trade, making the best use of sustainable energy resources in different areas. Countries need to work together to extend electricity networks. Massively expand our capacity for generating electricity for renewable sources, including support for local micro-generation in areas where people have limited or no connection to grids.

3. Access. End energy poverty: provide clean electricity and promote sustainable practices, such as efficient cook stoves, to everyone in developing countries.

4. Money. Develop financial instruments to encourage renewable investment. Divest from fossil fuel and nuclear energy firms. Use market incentives to encourage energy efficiency. Invest in renewable, clean energy and energy-efficient products and buildings. Substantial investment is needed into public transport. We need urgent investment in smart grids to manage energy demand and allow for a higher proportion of electricity to come from variable and decentralised sources.

5. Food. Stop food waste. Choose food that is sourced in an efficient and sustainable way to free up land for nature, sustainable forestry and biofuel production. Everyone has an equal right to healthy levels of protein in their diet – for this to happen, wealthier people need to eat less meat.

6. Materials. Reduce, re-use, recycle – to minimize waste and save energy. Develop durable materials. And avoid things we don't need.

7. Transport. Provide incentives to encourage greater use of public transport, and to reduce the distances people and goods travel. Promote electrification wherever possible, and support research into hydrogen and other alternative fuels for shipping and aviation. By 2050, all cars, vans and trains globally should run on electricity.

8. Technology. Develop national, bilateral and multilateral action plans to promote research and development in energy efficiency and renewable energy.

9. Sustainability. Ensure that all large-scale energy infrastructure developments satisfy independent social and environmental impact assessments. Outlaw land grabbing. Stop unsustainable deforestation. Develop and enforce strict sustainability criteria that ensure renewable energy (including bioenergy) is compatible with environmental and development goals. Developing countries must phase out the inefficient use of traditional biomass. Limit growth in areas that depend on liquid fuels – at least until secure and sustainable supply of bioenergy is established.

10. Agreements. Support ambitious climate and energy agreements to provide global guidance and promote global cooperation on renewable energy and efficiency efforts. Global negotiation a strong focus on providing finance and technology to help developing countries. Multi-and bilateral agreements must include support from richer countries to help poorer countries develop sustainable energy projects. Develop ambitious cap and trade regimes, nationally and internationally, that cover all large polluters. Setting a high price on carbon will help encourage investment in renewable energy and energy efficiency.

Source: WWF, Ecofys, OMA, The Energy Report: 100% renewable energy by 2050[216]

The WWF renewable energy report does not consider in any detail the potential of emergent renewable energy technologies, such as engineered or enhanced geothermal or nuclear fusion,

which, along with geoengineering (considered separately under 'technology' below, and not a 'renewable energy' technology in any event), are unlikely to form significant parts of the overall energy mix by 2050. For the sake of completeness, we mention these below.

Engineered (or enhanced) geothermal energy offers the promise of access to the earth's heat for human energy use whilst overcoming the need, in conventional geothermal techniques, for that heat to be extracted from permeable locations. Engineered geothermal energy aims to access heat found in locations surrounded by impermeable rocks. The techniques involve enhancing the permeability of the rocks so that the heat can be reached and extracted, using a transmission medium (typically water). Several pilot and demonstration programmes are under way. Barriers to take-up appear to relate principally to lack of investment and the costs of drilling for heat rather than any insurmountable technological challenges. Availability of water; an increasingly scarce resource; is one environmental concern, as is possible seismic activity associated with the process.[217]

Nuclear fusion (in contrast to nuclear fission; the process through which nuclear energy is currently generated) is the process by which atomic nuclei join together, or fuse, to form a single heavier nucleus; a process that can be accompanied by the release of large amounts of energy. Nuclear fusion is, in nature, the energy of the sun and the stars. Here on Earth, the promise of nuclear fusion lies with its potential to generate vast supplies of energy from readily available primary fuels and with relatively inert byproducts. Deuterium, for example, one of the possible primary fuels, can be extracted from heavy water. But the technical obstacles to successful nuclear fusion are formidable. The process calls for extremely high temperatures to be maintained in a contained environment over extended periods of time; and whilst experiments have been under way for many years, sustained nuclear fusion has so far not been achieved. Nonetheless, some scenarios see nuclear fusion providing as much as 20-30% of the global energy mix by 2100 under certain baseline conditions,[218] with reactors potentially capable of introduction by 2060-2070.

Energy and Climate Change

How might energy and climate futures interact?

If anthropogenic climate change is principally about emissions of greenhouse gases such as carbon dioxide – peak oil represents the problem of a shortfall in fossil fuel resources, many of them major sources of greenhouse gas emissions.

Richard Heinberg argues that these two sets of issues are quite discrete: whilst climate change activists focus on the moral case for action to head off future disasters, peak oil activists are motivated by an immediate concern for self-preservation; even to the extent that they may argue that climate change could be effectively dealt with as a result of fossil fuel depletion. And yet, for all that the genetic make-up of these two agendas is diverse, the policy prescriptions are not, from some perspectives, so divergent after all.

If the production of fossil fuels is soon to peak (that is, if indeed it has not already done so), there is an urgent need to find ways to manage a transition to a less fossil fuel-dependent future. However, Heinberg suggests that climate change activists are prone to quote rather robust estimates of remaining reserves. As such, *moderate* climate activists, for example, might argue in favour of a switch to less carbon-intensive fuels such as natural gas, or might encourage investment in clean

coal technologies. The result can be impenetrable argument over numbers, fuelled by what Heinberg considers to be *"unrealistic optimism on the part of official forecasting agencies"*.[219]

At least in one respect both sets of analysts are clear: the substitution of renewable sources of energy for oil, gas and coal is desirable. But some kinds of renewable energy are more problematic. The development of biofuels, for example, whilst offering a potential replacement for liquid transport fuels, can bring tradeoffs with food production. In addition to substitution strategies which involve *"finding replacement sources of energy"*, Heinberg points out that another set of strategies exists for simultaneously dealing with the twin problems of peak oil and climate change: conservation strategies. These involve *"using energy more efficiently or just doing without"*.[220] It is arguable that conservation strategies are *less* politically viable given current democratic circumstances than substitution strategies since they require significant behavioural changes or lifestyle sacrifices. They are, however, likely to require less planning and investment.

Despite the opportunities for synergy between strategies for addressing peak oil and those for combating climate change, the policy distinctions between the two agendas remain. In the UK at least, encouraging signs of change can be found. The Transition Town movement, for instance, represents a potentially helpful bridging mechanism for the two agendas. As the movement's website puts it: *"[c]limate change makes this carbon reduction transition essential. Peak oil makes it inevitable. Transition initiatives make it feasible, viable and attractive (as far as we can tell so far)"*.[221]

Shell's 2008 scenarios report is especially useful in shedding light on the trade-offs between climate change and peak oil, since it focuses on energy to 2050.[222] Three hard truths about energy supply and demand can no longer be avoided, says the report: consumption of energy is set to intensify as developing countries enter their most energy-intensive phase of economic growth; supply will struggle to keep pace with these new demands; and environmental stresses are increasing. *Even if* it were possible for fossil fuels to maintain their current share of the energy mix and respond to increased demand, emissions of carbon dioxide would, in the oil company's words, "*then be on a pathway that could severely threaten human well-being"*.

Policy turbulence is likely to continue for some time if for no other reason than the lack of consensus over prioritisation. As Jan Horst Keppler puts it, in the European context, there is a "*lack of a sustainable policy trade-off between the competing objectives of energy supply, competitiveness and environmental protection"*[223]. Following a swing towards environmental protection around 2007-2008, and an increasing concern over climate change, a volley of articles and reports have since began to argue in favour of rebalancing policy efforts so as to accord greater priority to energy security and peak oil. For example, in 2008 the UK Industry Taskforce on Peak Oil and Energy Security issued a report arguing, with some sophistication, that *"peak oil is more of an immediate threat to the economy and people's lives than climate change. The Taskforce is not saying that climate change is less important but that the impacts of a decline in easily and cheaply available oil will hit us before the worst impacts of climate change. The Government needs urgently to reflect this threat in their analysis and planning."*[224]

The IPCC's SRES Scenarios neglect the idea of peak oil. A majority of the SRES report's forty emissions scenarios entail a projected increase in the consumption of fossil fuels throughout the

course of the 21st century. The question of whether fossil fuel reserves will actually be adequate to support these scenarios receives little attention in the IPCC's outputs.

Society

Population and demographic shifts

The United Nations Population Fund suggests that *"[w]e are living in a world of unprecedented demographic change"*.[225] The process of change is at heart the outcome of a rapid increase in the number of people on the planet.

Following a prolonged period of relative stability (indeed, for the majority of human history), the world's population "*more than doubled in the last half century to reach 6 billion in late 1999".* And thanks to *"[l]ower mortality, longer life expectancy and a youthful population in countries where fertility remains high"*,[226] population growth has continued into the 21st century.

The world's population has already exceeded 7 billion. And in May 2011, the UN reported on the implications of small variations in fertility on the size of the global population. According to the median fertility projection in the 2010 Revision of World Population Prospects[227], global population could reach 9.3 billion by 2050 under a *median* fertility projection, reaching 10.1 billion by 2100. A small *increase* in fertility (just half a child above that of the median variant) could however increase the global population projection to 10.6 billion in 2050 and 15.8 billion in 2100. And a fertility decrease of just half a child below the medium could produce a population of 8.1 billion in 2050, declining to 6.2 billion in 2100.[228]

An overwhelming majority of the world's population growth is projected to occur in high-fertility developing countries, particularly among the poorest populations in urban areas. Populations in Afghanistan, Liberia, Niger and the Democratic Republic of Congo, for example, could triple by 2050. And given that these states are already poor and fragile, with significant governance challenges, there is a risk that such rapid population growth could fuel instability and extremism.

In earlier figures, produced in 2009, the United Nations Population Fund (UNFPA) suggested that the developing countries' combined population would rise *"from 5.6 billion in 2009 to 7.9 billion in 2050"*.[229] By contrast, the UNFPA suggested that *"the population of the more developed regions is expected to change minimally, passing from 1.23 billion to 1.28 billion, and would have declined to 1.15 billion were it not for the projected net migration from developing to developed countries"*.[230] These figures are due to fertility rates being below the replacement level of 2.1 children per woman in all 45 developed countries.

Fertility rates are projected to decline in developing countries from 2.75 children per woman in 2005-2010 to 2.05 in 2045-2050.[231] The decline is expected to be even more drastic in the least developed countries: from 4.63 to 2.50 children per woman. These projections are naturally contingent on the increasing availability of family planning services, particularly in the poorest countries. And they also rely on a major increase in the percentage of AIDS patients receiving anti-retroviral therapy, and on the success of efforts to control the spread of HIV.

According to the 2010 Revision of Population Prospects,[232] populations of both low-fertility countries and intermediate-fertility countries are projected to peak *before* the end of the century. However, populations of high fertility countries would continue to increase to 2100.

Global population growth might be broadly assumed to threaten the environment: the integrated assessment models of the IPCC consider population to be one of the root drivers of greenhouse gas emissions. However, the UNFPA (2010) highlights the fact that *"[d]istinct population groups clearly impinge on the environment in different ways"*. Wealth, age structure, household size and the spatial distribution of populations are linked more closely to greenhouse gas emissions than is population size *per se*. For example, as fertility rates drop in developing countries, greenhouse gas emissions might be expected to drop too. However, since lower fertility is usually associated with economic development and urbanisation, developing countries could, in fact, see a rise in their *per capita* greenhouse gas emissions unless a concerted effort is made to pursue low carbon development paths.

New *et al* point to the dual stresses of climate change and population growth in the 21st century: "*Many population scenarios project that world population will peak at about nine billion in the 2050s, with the largest increases between now and then concentrated in emerging economies. Demand for food and water will rise (and possibly peak) in parallel with this. If climate warms rapidly – as might occur with a steep rise in emissions, with a high peak emissions rate... – a temperature of anywhere between 2°C and 4°C might be reached by the 2050s or 2060s, precisely at the time when vulnerability as a result of population demands for food and water is highest."*[233]

Age structure

Besides changes in the overall *number* of people projected to inhabit the planet in the future, the *age* of the planet's inhabitants is also predicted to change. Declining fertility is linked to increasing longevity. According to 2009 figures: *"[t]he world's population is not only growing larger, it is also becoming older"*.[234] The majority of the additional 2.53 billion people in 2050 will be distributed *"among the population aged 15-59 (1.2 billion) and 60 or over (1.1 billion)"*.[235]

In the 2010 *Revision of World Population Prospects*, the UN reports that "*low-fertility groups tend to have, as a group, higher average life expectancy. It was estimated at 74 years in 2005-2010 and is projected to rise to 80 years in 2045-2050 and to 86 years in 2095-2100. Globally, life expectancy is projected to increase from 68 years in 2005-2010 to 81 in 2095-2100.*"[236] The process of population ageing is fastest in the world's low-fertility countries, and slowest among high-fertility countries, as shown in *Table 11*.

Table 11: Our changing ages in 2050 and 2100

	High fertility countries: % 65 or over	High fertility countries: % 25 or under	Medium fertility countries: % 65 or over	Medium fertility countries: % 25 or under	Low fertility countries: % 65 or over	Low fertility countries: % 25 or under
Year 2050	6	48	6	47	26	24
Year 2100	16	35	26	26	28	27

Source: 2010 Revision of World Population Prospects[237]

The trend towards an ageing population is a global phenomenon. In developed countries there are already more older people than there are children. And while developing countries are still typically dominated by young people, the proportion of older people is increasing rapidly due to declining fertility rates. According to a 2010 report from UNFPA, *"during the next 45 years, the number of persons in the world aged 60 years or older is expected to almost triple, increasing from 672 million people in 2005 to nearly 1.9 billion by 2050"*.[238]

The *distribution* of elderly people is also predicted to change. In 2010, 60% of people over 60 years lived in developing countries; by 2050 that proportion is projected to have increased to 80%.

Perhaps the most notable change, however, will be in the number of *'oldest-old'* people. The number of those who are 80 years old or over is expected to rise from 86 million in 2005 to 394 million in 2050.[239]

A key indicator of an ageing population is median age. In 2010, a mere 11 countries had a median age of over 40. By 2050, however, 90 countries are expected to fall into that category.[240] Young people are decreasing in number, particularly in the developed world.

In terms of an ageing population's impact on democracy, a Commission on Global Ageing, comprising economists, business people and politicians, claimed in 1999 that an ageing society promises to *"restructure the economy, reshape the family, redefine politics and even rearrange the geopolitical order of the next century"*.[241] The Council of Europe's Green paper on the future of democracy in Europe argues that elderly people will be "*more likely to vote, join associations, and hence acquire the political influence needed to appropriate an increasing share of public funds and policy benefits for themselves"*.[242] Furthermore, a report by the Organisation for Economic Co-operation and Development adds that since elderly people are more vulnerable to certain risks, such as climate change, "*their attitudes could have an impact on how risks are perceived and managed"*.[243]

The issues go deeper, too. *Paper Three* pointed to risks, highlighted in literature on 'the future of democracy', that the formal processes of representative democracy could increasingly be dominated by a grey-haired older population, with younger voters organising themselves and their political engagement much more readily through processes – particularly those of burgeoning social media – that are disconnected from the business of parliamentary and legislative debate, the internal workings of party politics, or the formal rules of procedure of representative democracy. Link that to resource scarcity and the prospects of deepening inequalities between younger and older generations (exemplified in the British book *Jilted Generation*[244]), and all kinds of new pressures could emerge, not only for democracy but also for the prospects of effective mitigation of and adaptation to climate change.

Countries such as Japan, Italy, Germany and Sweden will face the pressures of an ageing population first. In contrast to population growth, the task of integrating the effects of an ageing population into democratic governance will fall to be tackled first by those nations whose governance structures *arguably* equip them better for the task.

Urbanisation

The prospects for managing climate change through mitigation and adaptation will be significantly affected by urbanisation; the processes through which people come to live in urban areas.

The number of people worldwide living in urban areas is increasing globally. And the increase is predicted to continue into the future, not only due to growing urban populations, but also due to declining rural populations. According to the Population Division of the United Nations Department for Economic and Social Affairs, the global rural population is *"projected to start decreasing around 2020 and 0.56 billion fewer rural inhabitants are expected in 2050 than today"*.[245] This means a rural population decline from 3.4 billion in 2010 to 2.9 billion in 2050.

While rural populations may not begin to decline until 2020, a surge in urban populations is already under way, and has been for some time. According to a United Nations Habitat report, 50.6%, or 3.5 billion, of the people on Earth currently live in cities.[246] As a planet we have already reached the tipping point beyond which the population is more urban than rural.

Despite the overarching global trend towards intensified urbanisation, the urban transition is taking place at different times and rates in different areas, and with a diverse range of associated economic growth patterns. For example, according to the *World Urbanization Prospects* report, North America, Latin America and the Caribbean, Europe and Oceania are highly urbanised, with the proportion of urban dwellers ranging from 70% in Oceania to 82% in North America. The level of urbanisation is expected to continue rising, albeit slowly, so that by 2050 all of these areas, bar Oceania, are expected to be at least 84% urban.[247]

In contrast, Africa and Asia remain predominantly rural, with just 40% and 42% of their respective populations living in urban areas in 2010. Even by 2050, they are expected to be significantly less urbanised than other major regions, with Africa reaching an urban proportion of 62%, and Asia 65%. Africa and Asia are predicted to reach their respective tipping points in 2030 and 2023. To put these figures into context, *Table 12* summarises urbanisation and associated tipping points by region.

Although the statistics reveal lower levels of urbanisation and later tipping points for Africa and Asia, this should not obscure the rapid rural-to-urban shift that these continents are currently experiencing, and will continue to experience. To illustrate this point, *"[b]y 2009, 140 out of the 230 countries or areas constituting the world were already more than half urban. Over the next four decades, 66 countries or areas, amounting to 29 per cent of the total, are expected to reach that threshold for the first time, 30 of which are located in Africa, 17 in Asia, 10 in Latin America and the Caribbean, five in Europe and four in Oceania"*.[248] Furthermore, even the least urbanised countries in Africa and Asia, with currently over 80% of their populations still living in rural areas (Burundi, Cambodia, Ethiopia, Malawi, Nepal, Niger, Rwanda, Sri Lanka and Uganda), are expected to be at least 30% urban by 2050.

Table 12 Regional tipping points for greater than 50% percentage urban populations

Region	Tipping point before 2010 (year)	2010 urban (%)	Tipping point after 2010 (year)	2050 urban (%)
World		50.6		70
MORE DEVELOPED REGIONS	before 1950	75		86
Europe	before 1950	72.6		83.8
Eastern Europe	1963	68.8		80
Northern Europe	before 1950	84.4		90.7
Southern Europe	1960	67.5		81.2
Western Europe	before 1950	77		86.5
LESS DEVELOPED REGIONS		45.3	2020	67
Africa		40	2030	61.8
Sub-Saharan Africa		37.3	2032	60.5
Eastern Africa		23.7		47.6
Northern Africa	2005	52		72
Southern Africa	1993	58.8		77.6
Western Africa		44.6	2020	68
Asia		42.5	2023	66.2
Eastern Asia		48.5	2013	74.1
South-central Asia		32.2	2040	57.2
South-eastern Asia		48.2	2013	73.3
Western Asia	1980	66.3		79.3
Latin America and the Caribbean	1962	79.4		88.7
Central America	1965	71.7		83.3
Rest of the World				
South America	1960	83.7		91.4
Northern America	before 1950	82.1		90.2
Oceania	before 1950	70.6		76.4

Source: Adapted from UN Habitat, 2010[249]

Asia is leading the way on another global urbanisation trend: the relative numbers of people living in highly populated urban areas. The 2009 revision of the *World Urbanization Prospects* report reveals that there is a trend towards people residing in '*megacities*' of over 10 million inhabitants, as opposed to other urban areas: while "*[t]oday's 21 megacities account for 9 per cent of the world urban population (324 million), [t]hese cities are expected to number 29 in 2025 when they will account for 10 per cent of the urban population"*.[250] Of the world's 21 current megacities, 11 are in Asia. What's more, of the eight additional megacities expected to emerge by 2025, five will be in Asia, of which three will be in China (Shenzhen, Chongqing and Guangzhou).

The projected increase in people living in megacities could potentially worsen the impacts of climate change-driven natural disasters. As events like Hurricane Katrina and the 2010 Pakistan floods have

already demonstrated, the consequences of natural disasters which occur in large, densely populated urban areas can be catastrophic.

Asia in general, and China in particular, also leads the way in terms of current and predicted numbers of cities of over half a million inhabitants. Of the 958 cities with over half a million inhabitants in 2010, 52% are in Asia, with 25% of the global total in China. China's share reflects a major and increasingly rapid wave of urbanisation in the country: *"Starting in the 1990s, the number of cities in China with at least half a million inhabitants has increased markedly. In 1980, China had only 51 cities of that size. Between 1980 and 1995, another 50 were added to the group and, between 1995 and 2010, 134 additional cities in China crossed the half a million threshold. By 2025, China is expected to add another 107 cities to that group."*[251]

While urbanisation trends can be reviewed in isolation, it is also worth noting that urbanisation is linked to several other variables. For instance, a UN Habitat report[252] highlights the fact that the degree of a country's urbanisation is now an indicator of its wealth. The report notes that the more urbanised a country, the higher the individual incomes; the only exceptions being countries ravaged by civil war and/or where extreme inequalities have blocked development.

The UN Habitat report also indicates a positive correlation between urbanisation, wealth and population growth in regions within individual countries. For instance, Morocco's Tangier-Tetouan area, the Mekong River Delta in Vietnam, and the Northern Capital Region in the Philippines all have stronger economies relative to the rest of their respective countries, are more urbanised, and have population growth rates about twice or three times the national average.

At first glance, it might appear that a combination of increased wealth and rapid population growth in urban areas could seriously hamper attempts to mitigate greenhouse gas emissions. However, the compactness of cities also presents great opportunities. There are economies of scale that arise out of urbanisation; with increases in urban living potentially making it easier and cheaper to deliver infrastructure, services (and energy) to a significantly enlarged global population. Urban density decreases the land occupied per capita. Cities can reduce per capita energy use, and take the pressure off rural areas.[253]

Futurist and ecologist Stewart Brand argues that cities offer the best hope of escaping poverty, because they are *"so much more successful in promoting new forms of income generation, and it is so much cheaper to provide services in urban areas, that some experts have actually suggested that the only realistic poverty reduction strategy is to get as many people as possible to move to the city."*[254] Concentration and density make social service provision easier.[255] And cities also benefit from 'economies of agglomeration', in which density accelerates economic activity.[256]

Brand goes further: he argues that cities are the greenest thing that humanity does for the planet.[257] Not only could concentration of people in cities offer a viable way to bring down carbon emissions; it could also curb greenhouse gas-emitting population growth. For urbanisation, argues Brand, also defuses the 'population bomb', triggering reduced fertility.[258] Population rates go down when birth rates are less than 2.1, and *"because urbanization is currently taking place most rapidly in developing countries, the drop in birthrate is most rapid there, which means those populations are aging the most rapidly, though the effects won't be felt for a while."*[259]

Urbanisation, as distinct from population growth, then, *could* be good for the prospects of action on climate change. But urban climate crisis could cause disruption (and trigger crisis) for larger numbers of people than the impacts of climate change at the household level in rural areas; with all the associated potential positive and negative impacts on democracy that that entails.

Natural and man-made disasters

We have already seen how urbanisation could worsen the impact of natural or man-made disasters. And we have also seen how disasters – from the New Zealand earthquake of 2010 and its continuing aftershocks, to Spanish flu in the early twentieth century – can trigger roll-back of democracy.

Natural disasters such as famine, epidemic or even pandemic, have the potential to trigger economic slowdown or recession (as following the 2011 Japanese earthquake) massive social unrest and even societal breakdown; new institutional and policy responses; new alliances of actors; and business innovation (as with the trend, in the early 21st Century, for business to consider its contribution to poverty reduction within the overall corporate social responsibility agenda). But such disasters can also act as a wake-up call and a trigger for positive transformation at every level of society. As argued above in *Section* 2, disasters can speed up time.

As with wars, it is difficult if not impossible to speculate generically – across the vast range of possible disasters – on which way any single disaster could propel democracy. Whether man-made (such as anthropogenic climate, the meltdown of a nuclear reactor, or a massive leak of radioactive waste) or natural, they are 'wildcards' of human futures.

We consider the impacts of climate-related disasters separately, drawing on the analysis of climate science in *Paper Four*, as we develop our scenarios. However, it is worth highlighting briefly here the potential 'democracy' effect of a massive and clearly anthropogenic climate change-related disaster – which we also speculate on elsewhere. For as time goes on, and an increasing number of natural disasters are viewed with alarm by members of the public; might we collectively reach a tipping point where a single disaster might trigger a tsunami of public concern to take action on climate change?

Some commentators had hoped that this might be one of the effects of Hurricane Katrina in New Orleans. But there, as before, the impacts of the disaster were unevenly distributed between 'haves' and 'have-nots'. The links to climate change were not clearly made, and arguably could not have been, even by those who wished to do so. As human beings we might also, collectively, become immune to the shock effect of single-event natural disasters; particularly those in distant places. And even if climate change-related natural disasters were to shock people into action, there is no guarantee that the action would be climate action. Rather, for people not directly affected, natural shocks have often been little more than temporary drivers of increased charitable giving.

Values, lifestyles and behaviours

We have already seen that a problem of short-termism, linked to values associated with individualism and self-interest, create obstacles when it comes to getting democracy to work better for climate change mitigation and adaptation. And the values associated with consumerism and with

the liberal economy – too often themselves short-termist and highly individualistic – also provide part of the glue that binds liberal democracy to economic liberalism.

If the tensions between liberal democracy and effective climate action are to be overcome, values change would be a very powerful tool in the overall recipe for transformation.

The combined ethical, social and behavioural dimensions of change also act as powerful drivers of change in the future of democracy in the face of climate change. These are embodied in a range of factors discussed in papers *One* and *Three*, and they include worldviews; identities; and everyday structures shaping and constraining choices such as infrastructure, work, finances and incentives; as well as everyday discourses over media and politics.[260]

The future relationship between democracy and climate change will in part, then, be determined by the changing shape of human values; by the evolving outcome of the competition between different worldviews that is seen so clearly in the current clash between so-called 'warmists' and 'sceptics'; and by the changing mix of ways in which we view ourselves, and are viewed by our elected representatives, whether as consumers or citizens.

The intensity of climate impacts (those arising before any comprehensive breakdown in existing governance arrangements) will themselves have an impact on the willingness of people to engage in tackling those impacts – and hence on the political drivers of change in the fabric of democracy itself. But what determines whether democracy rises to the challenge, by adapting or evolving, is likely to turn instead on a variety of other external drivers of change. These include wider debate about risk and precaution, the role of civil society and expert argument in driving change, and natural resource scarcity or peak oil.

In a scenario in which climate impacts are incremental or minor, it is entirely feasible that democracy could experience a kind of 'boiled frog' syndrome.[261] Conversely, *"much will depend on the methods and metaphors used to communicate the probable and possible changes that will need to be averted through costly and controversial action now"*.[262]

Themes of identity and belonging appear in both democracy and global governance futures literature. And there is also an important (though not inherently futures-oriented) literature on cognitive science and its implications for transformational change. In *Paper Three*, we highlighted evidence that, as Richard Dawkins would have it, humans possess a unique *"capacity for genuine, disinterested, true altruism"*[263] that distinguishes us from many other species.

Scenarios for the ethical, behavioural and social impacts of climate change are poorly developed in the overall body of literature on climate change,[264] and they are omitted entirely from the IPCC's work, though they are likely to exert significant impacts both on democracy and the ways in which it tackles climate change. Yet if formal 'democratic' structures were to fall away with rapid climate change and associated impacts, an underlying set of behaviours would remain.

These underlying behaviours can be clustered, on the basis of the work of Thompson,[265] in the suggestion that *"attitudes and behaviour in relation to climate change and environmental issues reflect five basic orientations or worldviews (also termed 'solidarities') that encapsulate distinct modes of social organisation and approaches to risk and the natural world. These worldviews*

(fatalist, individualist, hierarchist, egalitarian and 'hermit') are, it is argued, always present in varying degrees in groups, organisations and whole societies, and need to be acknowledged and lived with, as they represent basic clusters of attitudes and value that are not likely to be dropped or modified significantly except in the face of overwhelming information and evidence".[266]

Mannermaa's visions of democracy futures, highlighted in *Paper Three*, reflect the latent hypothesis that the decision-making of each wave of development mirrors the core characteristics of that era of development – including its core values and its associated technologies. His description of the information society, for example, amplifies John Keane's monitory democracy. He describes what he calls the 'ubiquitous network society' in which wireless data transfer and networking are possible for anyone, at any time, anywhere and by any means.[267]

A further dimension of the information society is its association with *"an ever more complex society of risk"*.[268] Crashes and computer viruses, power cuts and terrorism all have the potential to disable the information society with dramatic consequences – though some risks (such as that of the Y2K bug) will almost certainly be overstated.

Mannermaa suggests that there are no signs of the trend towards an ever more complex society of risk drawing to a halt, let alone of any move towards a simpler and more manageable world. The problem, he says, drawing on the work of Finnish eco-philosopher Pentti Linkola, is that the attractiveness of such a society is 'close to zero' in most people's minds.

In contrast, Richard Heinberg argues that "*a reversion to the normal pattern of human existence, based on village life, extended families, and local production for local consumption – especially if it were augmented by a few of the frills of the late industrial period, such as global communications – could provide future generations with the kind of existence that many modern urbanites dream of wistfully"*.[269]

Perhaps the information society and globalisation – and the associated rise in 'societal risks' – simply make us too *comfortable* with the idea of living with the risks of climate change; numbing us, cognitively and in terms of shared values, to their profound ethical implications. Perhaps in the Western industrialised world we no longer reach for our values as a guide to action in the same way as in a less interconnected world? Against this insight, however, we might counter that on the contrary, the world's increased interconnectedness brings the impacts of our activities on other people and in other places closer to home than ever before, and more quickly than ever before. The ethical consumption movement and the 'anti-globalisation' movement are themselves manifestations of the pathways through which we recognise our interconnectedness as human beings.

Any transition from individual to thinking and action based on a stronger sense of the collective 'us' than the individual 'I' is countered by the possibility that the future could hold an intensification of individualism. On one hand, the Carnegie UK Trust ventures that *"this trend towards individualism may have reached its apogee"*,[270] trumped by the rising well-being movement. If we are indeed coming to the conclusion of a major wave of individualism globally, the pendulum may naturally swing (as a result of a host of external drivers and changes within the overall human system) towards less individualism. On the other hand, a scenario for 2025 from the same organisation, dubbed *'Athenian Voices (Electronic Age)'*[271], sees future technology and innovation leading to

increased atomisation and individualism. Networks might indeed grow stronger, but they could be geographically dispersed or virtual, and they might sustain rather than challenge individualism.

In an important paper which suggests not only that a values shift to post-materialism may indeed emerge over the next ten years, Hardin Tibbs reviews values data over the past forty years or so from Europe and North America and finds in it the seeds of a potentially transformative shift in values.[272] Indeed, some surveys provide the basis for a plausible claim that richer countries may have already reached a cultural turning point (though it is certainly one that is not yet reflected in dominant political practices). In most of the world's richer countries we are now at, or close to a point of crossover posited by Fritjhof Capra, whose 1982 book *The Turning Point* proposes the idea of a turning point between a declining value system and a new rising value system.

As cited in Tibbs's paper, Capra argues that:

> *"During the process of decline and disintegration the dominant social institutions are still imposing their outdated views but are gradually disintegrating, while the new creative minorities face the new challenges with ingenuity and rising confidence...The social movements of the 1960s and 1970s represent the rising culture, which is now ready for passage to the solar age [characterised by the use of solar energy]. While the transformation is taking place, the declining culture refuses to change, clinging ever more rigidly to its outdated ideas; nor will the dominant social institutions hand over their leading roles to the new cultural forces. But they will eventually go on to decline and disintegrate while the rising culture will continue to rise, and will eventually assume its leading role"*[273]

Values change, it seems, is not only possible over the short to medium-term, but may even be imminent; precipitated by the (relative) economic and physical security prevailing since World War II. The most significant change that might be expected soon, Tibbs argues, is a shift in the cultural story relayed by the mass media. Tibbs argues, however, that as Capra pointed out:

> *"the declining culture is likely to resist relinquishing its dominance, which may account for the heightened levels of political tension in the United States during the first decade of the 21st century. So, rather than a smooth transition, a period of turbulence may be a more reasonable expectation. This would resemble the bursts of chaotic behaviour observed in systems on the threshold of bifurcation – spontaneous shifts to new patterns of order."*[274]

Whether a shift in values in the world's richest countries will be matched by middle and low income countries, or whether they will rather connect to the outgoing values of the richest nations to the extent that those go hand in hand with economic growth, is at least a moot point. But as Tibbs himself argues, the values evidence that he brings together offers a plausible and timely case for hope. Whether the values shift has acquired sufficient momentum to survive the economic insecurity of the early twenty-first century is another moot point. But at least there is a plausible basis for the suggestion that values may shift towards something like our 'far and wide' value set over the course of even the next forty years, let alone the ninety year period to 2100.

For purposes of our scenarios framework, we have separated 'values' from 'behaviours and lifestyles'. Values can affect both human behaviours and lifestyle choices, but many other factors

affect behaviours besides values. We therefore treat behaviours and lifestyle choices as 'impacts' or 'responses' rather than drivers in our scenarios framework.

Religious adherents

For many people, values and beliefs – the underpinning of many human behaviours – find their foundations in organised religion and in faith.

Religious adherence and beliefs grounded in faith are potentially a driver of change both in democracy and in responses to climate change, insofar they have potential to drive human behaviours in ways that a secular state simply cannot, however impressive its citizens' respect for the rule of law.

Faith – for example the idea in some religions that faith is associated with 'saving your soul' – can certainly be individualistic. But faith is also potentially a significant source of non-individualistic values that could counter the ills of excessive consumerism and better serve effective mitigation of and adaptation to sustainable development. But there is also conventionally a dogma that democracy is essentially secular. We consider this closely related issue (i.e. the relationship between the state and organised religion) separately below.

In this subsection, we revisit some of the key insights on religion and faith as a driver of change, in the form in which these appeared in *Paper Three.*

One argument that sees religion playing a central role in the future of democracy asserts that the failure of consumerism as faith or core cultural value, combined with resource shortages and rising prices, will lead to a search for alternative values culminating in a resurgence of faith.

Efforts to address and transform (to the good) the cultural dimension of sustainable development will almost certainly have a strong faith-based dimension. However, whether that increases or decreases the likelihood of a clash of civilizations[275] along cultural and religious lines (too often crudely characterised as 'the West versus Islam') is necessarily a matter for speculation.

Shearman and Wayne Smith claim that "*in the social chaos of the future, only religion could replace consumerism"*.[276] They go on to suggest that the new social order will need some type of social glue; a role traditionally served by religion before its *de facto* replacement by secular materialism.

David Holmgren's scenarios for the next ten to thirty years,[277] considered earlier in this paper, are associated with a variety of developments in religious practice. Holmgren's starting point, as we saw earlier, is that climate change and peak oil will lead to a period of energy descent, and that this will have significant implications for the role of religion in society. Under his '*Brown Tech'* scenario (slow energy decline and severe climate change) religion becomes more prevalent in the working and unemployed classes, partly in response to the failure of modern humanism, and "*partly manipulated by the elites to deflect anger and disenchantment*".[278] Under the '*Green Tech'* scenario (slow energy decline and mild climate change), he imagines a *"transition towards a nonmaterialistic society [which] combines with the maturation of feminism and environmentalism, and a resurgence in indigenous and traditional cultural values. These trends stabilise the accelerating loss of faith in secular humanism"*.[279] Finally, in Holmgren's '*Earth Steward'* scenario (rapid energy decline, mild

climate change) "*simplification in the material domain is seen as opportunity for growth in the spiritual domain"*.[280]

Matthew Orr also sees new forms of religion emerging from the wreckage of a global environmental crisis.[281] He suggests that crises have historically spawned 'revitalization movements', which in turn have led to the emergence of many of the world's religions, including Christianity.

Richard Heinberg's narrative letter from the future of 2107 describes human survivors who "*think for themselves more"*, adding that "*[p]artly as a result of that, the old religions have largely fallen by the wayside, and folks have rediscovered spirituality in nature and in their local communities"*.[282] Elsewhere, he links religion to the evolution of language, arguing that religion has served as an instrument of social and ecological conquest, serving up myths designed to consolidate the power of religious elites.[283]

While much of the literature on religion and democracy envisions increasing religious engagement in the future, arguments for a future decline of religion tend to be associated with analysis on the role of individualism or *'individuation'* in society. In broad terms, the latter term refers to a shift from "*historically generated socio-political categories such as class, race, religion, ideology and nationality to much more fragmented and personalised conceptions of self-interest and collective passions"*.[284]

We have not gathered sufficient evidence in the course of this project to make confident assertions about the possible future trajectory of faith (or religious adherence) around the world, let alone its impacts on democracy or climate change. For this reason alone, it remains one of the uncertain drivers of change in our project. However, we can certainly suggest that at times of crisis, people frequently turn to faith for guidance. In turn, changes in religious adherence may be an early indicator of shifts in underlying values and, potentially, culture itself – with significant effects both for the signals that are sent to elected representatives, and for attitudes to risk and to climate change and its impacts.

Participatory decision-making and engagement in society

From David Keane's work on monitory democracy to evidence of public engagement in political processes from sources such as the UK Hansard Society's annual *Audit of Political Engagement*; it is widely supposed that public participation, at least in Western liberal democracies, is in decline.

Taking *political* engagement first, and with an exclusively UK perspective at that, the well-respected Hansard Society's *Audit of Political Engagement* reported in 2011, at a time of economic stagnation if not decline, and the first peace-time coalition government for eighty years, that *interest* in politics had risen by five points to 53%. Additionally, almost half of those respondents who said that they were not interested in politics were interested in the way things work locally.[285]

However, there is no necessary connection between interest in politics and engagement in political processes. Hansard's 2011 Audit also revealed that people were far more positive about the efficacy of getting involved in their local community than about getting involved in politics: *"[a]round half of the public (51%) agree that 'when people like me get involved in their local community they really can change the way their area is run', while one in five people (21%) disagree. This compares*

favourably to the one in three (30%) who agree that they can change the way the UK is run by getting involved in politics and 44% who disagree".[286] Furthermore, *"[t]wo in five (39%) of those who do not think they can change the way the UK is run by getting involved in politics do think they can change the way their area is run by getting involved in their local community".*[287]

We have carried out too little work in the course of this project to generalise outside the UK. However, this limited evidence provides a basis for the argument that questions of participatory decision-making and engagement in society are separate from those of participation in political processes, and that they may be affected by different drivers and motivations.

In the UK context, the participation NGO *Involve* launched an important publication in 2011 examining the motivations and triggers for voluntary participation across the board.[288] The approach to participation in *Pathways through participation* spanned individuals' engagement in consultation processes to volunteering, participating in a local community group or (in an important inclusion that makes the research potentially less meaningful given our focus on democracy as a *political* system) purchasing fair trade products.

In terms of the impact of this driver on the future of democracy and on climate change, overall outcomes are strongly dependent on what views are expressed by people when they choose to engage. (We do not consider the impact of participatory decision-making on participatory decision-making since that would be tautological). That in turn is in part a function of the motivations and triggers for participation. As Involve note, *"[p]eople's upbringing, family and social connections play an important role in shaping their participation as does the environment in which they live: whether, for instance, the voluntary and community sector is thriving locally and whether local groups and organisations have a culture and facilities that support and encourage participation.*" But the Involve research also highlights, through interviews, the effects of a range of long-term societal and global trends on how they and others participate:

> *"**Social norms:** The shift towards greater individualism means many people do not know or interact with their neighbours and social networks within areas have weakened.*
>
> ***Communities:** Ties to particular communities of place have loosened as many people no longer live, study, socialise and work in the same place.*
>
> ***Mobility:** Participation can be further afield as people's mobility has generally increased.*
>
> ***Technology:** New forms of participation and social interaction have been enabled by technological developments, with a growth in communities of interest facilitated by the internet"*[289]

In addition to these overall drivers of participation, peoples' participation over time (and its form and motivations) is also influenced by a range of other factors. People's changing circumstances over the course of their lifetime are one variable, for example: Involve highlights critical moments including having a baby or hospitalisation. Personal motivations are important too, including *"helping others, seeking influence or wanting new social relationships, which are intimately connected to people's personality, identity, values and beliefs"*.[290]

National context and events also influence and can trigger people's participation. Involve cites examples including protests against wars in Afghanistan and Iraq and the Westminster MPs' expenses scandal of 2009-10.[291] The broad social and historical context also has an impact. For example, the 1960s were cited by some as a particularly influential time, and *"some interviewees who came of age... during a period of recession, seemed to have been profoundly affected and politicised as a result"*.[292] To reinforce this point, economic hardship and the sovereign debt crisis has certainly been a trigger for participation in mass protests in Greece over the course of 2011; though not, arguably, for participatory *decision-making*. And in the UK, a coalition government at a time of economic austerity has sought to encourage a 'Big Society', based on volunteering for good causes and community groups, though not necessarily participatory decision-making in the wider sense. Prime Minister David Cameron argued in July 2010 that:

> *"The Big Society is about a huge culture change… where people, in their everyday lives, in their homes, in their neighbourhoods, in their workplace… don't always turn to officials, local authorities or central government for answers to the problems they face… but instead feel both free and powerful enough to help themselves and their own communities".*[293]

We might also seek to explore what factors encourage people to continue to engage in participatory decision-making once they have begun to do so. *Pathways through participation* (which adopts a very broad definition of participation) argues that *"[o]nce an individual starts participating, the quality of their experience becomes particularly important to whether they continue, including the extent to which they feel they are making a difference and having an impact, whether they feel their contribution is valued, and the quality of the social bonds with other participants".*[294]

If values affect participation and potentially therefore engagement in participatory decision-making, it also seems likely that participation may have an impact on values – though there is little evidence to draw on in seeking to understand those impacts. As Ian Christie suggests, noting that participation remains largely a minority pursuit: "*as long as engagement is experienced by so few, and so irregularly, and is largely a by-product of something else (eg a local planning row, fury at a perceived threat to a community...) other than a widespread 'ecology' of democratic participation, it is hard to make well-founded generalisations".*[295]

There is a hidden assumption in this driver of change that there is a connection between participatory decision-making and engagement in society and the state of democracy as a *political* system rather than as a system of *social* organisation. But the correlation need not be a positive one, in the sense that participation in community groups or volunteering might itself be a response to perceived failures in formal representative democracy or disenchantment and lack of engagement in democracy as a political system (including participation such as responding to consultations). Arguably, the rise of the Transition Town movement (highlighted in *Paper One*) might be seen in this way; as a response to the failure of global and national governance to develop adequate responses to climate change. The focus in our scenarios lies with democracy as a *political* system in its broad social context. Consequently, we do not consider the impact of our drivers of change in relation to participatory decision-making unless they are related to democracy understood in this way.

Uncertainties associated with this driver of change are very high; particularly since the state of participation (globally at that) is the product of so many different variables – many of them themselves drivers of change in our project; and because available research appears limited. However, we can confidently suggest that whether the correlation is positive or negative, the state of participatory decision-making and engagement is likely to exert a significant impact both on democracy and (by means of the views that are expressed and the actions that result from that participation) both greenhouse gas emissions and responses to climate change. In other words, it is both a relevant and significant driver of change in the relationship between democracy and climate change, but with very uncertain outcomes.

Public willingness to base public climate policy on scientific evidence

Public willingness to base public policy on climate change on scientific evidence potentially drives both the climate-readiness of democracy and greenhouse gas emissions themselves. Low public willingness to accept even relatively clear evidence that challenges lifestyles or behaviours could be disastrous for progress on climate change within democracies. At the same time, *passive* (rather than active) public acquiescence in science-based policy interventions that reach deep into every sphere of life; perhaps triggered by climate shocks or recurrent natural disasters, could kill the essence of democracy: decision-making by the people, not simply 'consent of the people'. However science-based the policy, there is a strong case to be made for active not passive consent.

We saw in *Papers One* and *Four* how a battle of words (and underlying values) over climate science between so-called 'warmists' and (climate) 'sceptics' of various hues, linked to economic downturn in many of the world's industrialised nations, has given rise to a shift away from public concern about climate change. The shift is neither major nor conclusive, but nonetheless generates numerous challenges for policy-makers in democracies where policy measures need to carry overall public support and where the principal mechanism for checking that support is often the crude snapshot of the public opinion poll.

In a contentious policy area such as climate change, where the role of expertise and science in the decision-making process demands more sophisticated approaches to public engagement than simple opinion poll surveys or uninformed referenda, there is a particularly strong imperative to ensure the legitimacy of the policy and legislative process as part of the underpinning for science-based policy-making.

One unsurprising response by politicians can be to purport to take the politics out of decision-making by passing certain key decisions *entirely* to experts (as in the case of the UK Committee on Climate Change, which has an advisory role in making recommendations to government on setting and meeting national carbon budgets[296]). This is contentious from a democracy perspective, but tempting for politicians.

The challenge, as identified by some of the writers whose work was highlighted in *Paper Three*, is to find ways of creating 'guardian institutions' that can retain their overall legitimacy in the context of a thriving and vibrant democracy.

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Technology

Technology and its cycles

Technology – that is 'hard' technology rather than the 'soft' technology of knowledge and understanding – is both a driver of change in the relationship between democracy and climate change, and a driver of greenhouse gas emissions. As a driver of greenhouse gas emissions, it is helpful to understand technological innovation in terms of its capacity to *respond* to climate change (considered further below). But as a driver of change in the *relationship* between democracy and climate change (i.e. as a driver of change in the impacts of democracy on climate change; and the impacts of climate change on democracy), a far broader range of technological developments becomes relevant.

Three headings are potentially relevant:

- Technological innovation for climate change mitigation and adaptation
- Technological innovation applied to the *practice* of democracy
- Other technological innovation

We highlight some of the specific applications of technological innovation for climate change mitigation and adaptation further in separate sections below. We devote particular attention to the emerging potential of geoengineering because of the long time horizon for our scenarios (to 2100) and because it is so closely connected, for some people, with the idea that it is possible to overcome the potential for even catastrophic climate change through (conceptually) simple technological fixes.

If we are currently in the midst of an 'information revolution' (a revolution which itself has major implications for both the practice of democracy and for climate impacts, as well as the relationship between democracy and climate change), it seems likely that by 2100 we will have emerged from the 'information technology' revolution and into (and possibly out of) one or even several more technological revolutions.

Biotechnology, nanotechnology, green technology and its relative geoengineering, offer contemporary pointers to future change – as does the idea that the *societal* implications of what could happen next might be dubbed the 'biosociety' (as opposed to the contemporary 'information society' or its predecessor, 'industrial society').

Economic 'long wave' theory, considered earlier, is, as we have seen, heavily influenced by thinking about and evidence of 'technological' waves. Daniel Šmihula[297] identifies six 'long economic waves' since the 1600s; each triggered by a specific technological revolution:

1. (1600-1740) The wave of the financial-agricultural revolution
2. (1780-1840) The wave of the industrial revolution
3. (1880-1920) The wave of the technical revolution
4. (1940-1970) The wave of the scientific-technical revolution
5. (1985-2000) The wave of the information and telecommunications revolution
6. (2000-)Post-informational technological revolution wave

Each new wave is shorter than its predecessor; an outcome of accelerating scientific and technological progress. Each is characterised by an innovation phase and an implementation or application phase. The end of each application phase is typically reflected in economic crisis. From this perspective, the financial crisis of 2007 onwards can be understood as heralding the end of the information and telecommunications technological revolution.

There are major uncertainties concerning the nature of the next 'technology waves' and their implications for either democracy or climate change. In 2011 the World Economic Forum Global Agenda Council on Emerging Technologies published its report *Building a Sustainable Future: Rethinking the Role of Technology Innovation in an Increasingly Interdependent, Complex and Resource-constrained World*.[298] The report links global (mega)trends to specific technology innovations and emerging technology platforms in *Table 13*. But the report cautions that:

> *"these are just possibilities, not probabilities. Without strategic investment in technology platforms, and informed nurturing of potential innovations into practical solutions, many of the technology innovations highlighted here will remain possibilities. This is at the crux of the challenge we face as we look to the future: how do we ensure that investment in technology innovation leads to innovations that we need to build a sustainable future, rather than simply innovations that someone can convince us we want?"*[299]

The report notes further that:

> *"In the past few years, technologies enabling unprecedented control over how matter is engineered at the level of atoms and molecules have come to the fore. In the near future, the rate of technology innovation and exploitation will become so rapid that multiple technological 'revolutions' will come and go in the space of a generation.*
>
> *Yet the rate at which we are learning to keep reap the benefits and manage the consequences of new and emerging technologies is not keeping pace with technology innovation."*[300]

Technological innovation waves can be both reinforced or undermined by climate change. If climate change or other major natural disasters – a global pandemic of epic proportions for example - knock human capacity to innovate through technology off course, the potential exists for at least a major disruption and potentially even a 'resetting' of technological cycles.

The severity of climate change impacts (along with other major resource disasters) is *itself* likely to be among the key determinants of the future of technological innovation. And the potential for technological innovation to take place in a variety of ways *before* catastrophic climate impacts occur on a global scale is among the most significant determinants of the relationship between democracy and climate change.

Table 13: Trends, innovation and emerging technology platforms

Global Trends			
Climate change, environment, and sustainability Rapidly growing demand for energy Limited resources Shifting centers of economic activity Growing demand for food, nutrition and health		Increasing scarcity and unequal distribution of water Corporate global citizenship Limited resources Social life in a technological world Demographics, including shifting populations and mobility	
Technology Innovations			
Vaccines Advanced sensors Next generation electronics Point of use energy generation Better food preservation Smart drugs Water desalination Strong, lightweight materials Automated traffic management	Carbon sequestration Soil management Efficient resources use Climate control Resilient crops Increased land productivity Thermal insulators Irrigation Better batteries	Smart grids Smart materials Bottom-up manufacturing Renewable energy sources Immersive communications High value crops Efficient resource extraction Disease management Advanced prosthetics	Better health diagnostics High conductivity materials Safer nuclear power Substitute materials Targeted pesticides Biofuels Water separation Sustainable production processes At-source water purification
Technology Platforms			
Nanotechnology Geoengineering Cognitive technology	Synthetic biology Robotics Computational chemistry	Information technology Biotechnology Artificial intelligence	Bio-interfaces Web 2.0 Data interfaces

Source: Building a Sustainable Future, WEF, 2011, page 2[301]

Whether peak oil or even peak 'everything' in Richard Heinberg's language will significantly disrupt the long waves or cycles of innovation remains a very significant uncertainty. Many of the wave theories of technological innovation are implicitly predicated on access to sufficient natural resources and adequate energy to underpin the shifts. This is an underlying assumption that is, as we saw in *Paper Three*, deeply contested by David Holmgren, who argues that climate change and decline in the availability of fossil fuels – or rather access to energy – are likely to be major factors of both technological and social evolution. He considers these the strongest forces shaping human destiny over the twenty-first century.

Technological innovation for climate change mitigation and adaptation

Technology can drive not only greenhouse gas emissions (in the sense that industrial technology is often carbon or greenhouse-gas intensive); it can also drive greenhouse gas emissions reductions. Climate change mitigation is strongly (though not exclusively) technology-dependent.

The availability of technologies is itself closely linked to the overall 'enabling environment' for technology investment and development. A range of mitigation technologies already exist, and more are projected to be commercially available before 2030, as *Table 14* shows.

Table 14: Key mitigation technologies and practices by sector

Sector	Key mitigation technologies and practices currently commercially available	Key mitigation technologies and practices projected to be commercialized before 2030
Energy supply	Improved supply and distribution efficiency; field switching from coal to gas; nuclear power; renewable heat and power (hydropower, solar, wind, geothermal and bioenergy); combined heat and power; early applications of Carbon Capture and Storage (CCS, e.g. storage of removed CO_2 from natural gas)	Carbon Capture and Storage (CCS) for gas, biomass and coal-fired electricity generating facilities; advanced nuclear power; advanced renewable energy, including tidal and waves energy, concentrating solar, and solar Photovoltaics.
Transport	More fuel efficient vehicles; hybrid vehicles; cleaner diesel vehicles; biofuels; modal shifts from road transport to rail and public transport systems; non-motorised transport (cycling, walking); land use and transport planning.	Second generation biofuels; higher efficiency aircraft; advanced electric and hybrid vehicles with more powerful and reliable batteries.
Buildings	Efficient lighting and daylighting; more efficient electrical appliances and heating and cooling devices; improved cook stoves, improved insulation; passive and active solar design for heating and cooling; alternative refrigeration fluids, recovery and recycle of fluorinated gases.	Integrated design of commercial buildings including technologies such as intelligent meters that provide feedback and control; solar PV integrated in buildings.
Industry	More efficient end-use electrical equipment; heat and power recovery; material recycling and substitution; control of non-CO_2 gas emissions; and wide array of process-specific technologies.	Advanced energy efficiency; CCS for cement, ammonia, and iron manufacturer; inert electrodes for aluminium manufacture.
Agriculture	Improved crop and grazing land management to increase soil carbon storage; restoration of cultivated peaty soils and degraded lands; improved rice cultivation techniques and livestock and manure management to reduce CH_4 emissions; improved nitrogen fertilizer	Improvements in crop yields.

	application techniques to reduce N_2O emissions; dedicated energy crops to replace fossil fuel use; improved energy efficiency.	
Forestry/forests	Afforestation; reforestation; forest management; reduced deforestation; harvested wood product management; use of forestry products for bioenergy to replace fossil fuel use.	Tree species improvement to increase biomass productivity and carbon sequestration. Improved remote sensing technologies for analysis of vegetation/soil carbon sequestration potential and mapping land use change.
Waste management	Landfill methane recovery; waste incineration with energy recovery; composting of organic waste; controlled waste water treatment; recycling and waste minimization.	Biocovers and biofilters to optimize CH_4 oxidation.

Source: IPCC WGIII, 2007[302]

Far more speculative is the potential for geoengineering options such as ocean fertilisation to remove CO_2 directly from the atmosphere; or to block sunlight. These options are neither associated with reliable cost estimates nor proven. However, given the extent to which the future relationship between democracy and climate change may be dependent on technological innovation (as distinct from social innovation), we explore the highly uncertain prospects for these technologies further below.

Working Group III of the IPCC's Fourth Assessment Report also notes the potential for changes in lifestyle and behaviour patterns (themselves partially culturally determined) to contribute to climate change mitigation. *Paper Three* highlighted the potential for behavioural changes to drive new forms of democratic engagement and public participation better attuned to achieving sustainable development outcomes.

Geoengineering

Technological developments are not only among the drivers of change in the relationship between democracy and climate change, but also one of the key sets of possible responses to climate change. One possibility, much-favoured by advocates of geo-engineering solutions to climate change, is that technology will evolve in ways that allow humankind effectively to mitigate the worst impacts of climate change. Even that possibility, however, is dependent on the outcome of public decision-making on issues like technology transfer, intellectual property, and licensing or permits.

Geoengineering – the deliberate large-scale intervention in the climate system in order to minimise anthropogenic global warming – is a relatively recent addition to the climate policy armoury. Yet it has a surprisingly long history, dating back to 1965 when then US President, Lyndon B. Johnson, received scientific advice to "*spread... reflective particles over 13 million square kilometres of ocean in order to reflect an extra 1 percent of sunlight away from Earth*".[303]

For decades, this idea and others like it barely gained traction. Yet today, geoengineering is being discussed more earnestly as a potentially useful complement to adaptation and mitigation. Much of this shift has resulted from the widespread realisation that mitigation efforts are likely to be too little, too late.

Yet despite growing interest, geoengineering is still in its infancy. The Intergovernmental Panel on Climate Change's 2007 Fourth Assessment Report sums up the state of play in the statement that

geoengineering proposals are "*largely speculative and unproven, and with the risk of unknown side-effects*".[304]

So what are these "*largely speculative and unproven*", technologies? And how might their future development and implementation interact with democracy?

As for the 'what?', geoengineering technologies are typically divided into two main groups. One consists of carbon dioxide removal methods, which take CO_2 out of the atmosphere. (Methods for removing other greenhouse gases from the atmosphere are also important, but are not discussed here). The other group consists of solar radiation management methods, which reflect some of the Sun's heat and light energy back into space by modifying the albedo (reflectivity) of the Earth.

Carbon dioxide removal methods include the following:

- **Changes in land use**, such as afforestation, reforestation and avoided deforestation, can protect or enhance carbon sinks. Whilst land use management is not always considered to be geoengineering in the strictest sense of the word, it does provide a useful yardstick for comparison with other methods.

- **Biomass** is a focus of carbon dioxide removal geoengineering due to its role in carbon sequestration and as a carbon neutral energy source. Biofuels are fuels made from biomass, whose CO_2 emissions (when burned) are roughly balanced by the CO_2 captured when the fuel crops are grown. As The Royal Society explains, "*one may use the biomass to make hydrogen or electricity and sequester the resulting CO_2 in geological formations*".[305]

  Biomass could also be sequestered as organic material without first being used as a fuel; for example by burying trees or crop waste in the land or deep ocean, or as charcoal (biochar). Essentially, these methods circumvent the natural processes of decomposition which return CO_2 to the atmosphere.

  More promisingly, biochar could be a potentially effective CDR method. It not only locks up CO_2 and is resistant to decomposition by microorganisms (due to the carbon atoms being bound more closely in biochar than in plant matter), but it can also improve agricultural productivity if added to soils.

- Another method for removing CO_2 from the atmosphere is by enhancing the natural processes of **weathering**, particularly the weathering of silicate rocks. Silicate minerals make up the Earth's most common rocks, and they react with atmospheric CO_2 to form carbonate (thus removing CO_2 from the atmosphere). This process, although a significant draw on atmospheric CO_2, takes place too slowly to compensate for the rate at which the burning of fossil fuels is adding CO_2 to the atmosphere.

  However, artificially reacting silicate rocks with CO_2 could accelerate natural weathering processes, with the products either being stored as solid minerals or being released into the oceans as dissolved minerals.

  While a variety of useful weathering reactions exists, the outcome of any method would be an increase in the bicarbonate and calcium/magnesium content – and hence the alkalinity –

of sea water. This could help halt the climate-driven ocean acidification which is currently threatening marine organisms. However, whether the combined effects of enhanced weathering on ocean biochemistry are adverse, negligible or benign remains to be seen.[306] The current state of understanding is expressed by The Royal Society: "*[t]here is no question about the basic chemical ability of the enhanced weathering of carbonate or silicate minerals to decrease CO_2 emissions and atmospheric concentrations. Primary barriers to deployment are related to scale, cost and possible environmental consequences*".[307]

- The method of engineered **capture of CO_2 from ambient air** is already used in industry, where CO_2 removal from air produces a pure CO_2 stream for use in subsequent industrial processes. Two key, though not overwhelming, challenges associated with ambient air capture are that the concentration of CO_2 in air is only 0.04%, and that the process of moving air through a capturing structure entails energy and material costs. This form of geoengineering is currently being developed commercially along three distinct trajectories: the absorption of CO_2 into solids, its absorption into highly alkaline solutions, and its (possibly more rapid) absorption into moderately alkaline solutions with a catalyst.

  All techniques would require some sort of energy input. On the other hand, however, these techniques would have "*a land-use footprint that is hundreds or thousands of times smaller than [biomass energy with carbon dioxide capture and sequestration] per unit of carbon removed*".[308]

  As with the more familiar '*carbon capture and storage'* (CCS) – discussed in detail by the IPCC[309] – the issue of how to safely store vast quantities of CO_2 is a central concern.

- A final carbon dioxide removal method involves the **enhancement of oceanic uptake of CO_2**. This is typically achieved by fertilising the oceans with naturally scarce nutrients such as nitrogen, phosphorus or iron, or by increasing upwelling processes.[310] The former is a means of increasing the growth of photosynthetic algae which take up CO_2 at the oceans' surface. When these algae die, they and other bits of dead organic material sink under gravity to the deep ocean, where their decomposition leads to the release of CO_2. In essence, CO_2 is removed from the atmosphere at the surface, and then released in the deep ocean.

  Although fertilisation techniques have received by far the most sustained research activity by the scientific community,[311] their efficiency at removing atmospheric CO_2 is not easily verifiable: it is difficult to know, either by direct measurement or modelling, whether they really work or not. Furthermore, the impacts of heightened nutrient levels on marine food webs are difficult to predict. Past experience of eutrophication in estuarine waters suggests we should approach this form of geoengineering with considerable caution.

  A second group of ocean-based geoengineering is "*based on the principle that the rate at which atmospheric carbon is transferred to the deep sea may be enhanced by increasing the supply of nutrients by the upwelling or overturning circulation of the ocean*".[312] One common proposal to enhance upwelling is the use of huge vertical pipes to pump water from hundreds of metres in depth up to the surface of the ocean.

Solar radiation management (SRM) includes the following approaches:

- There are several ways of **increasing the surface albedo**[313] of the planet; for instance, by brightening man-made structures (e.g. by painting them white), planting highly reflective crops, or covering deserts (and oceans, as President Johnson was advised to do) with reflective material. However, these approaches carry inherent trade-offs. On one hand, applications extending over large areas may be in conflict with other human land uses, such as agriculture and forestry. On the other hand, however, the widespread application of these techniques would be advantageous in terms of climatic impacts, compared to more localised albedo modifications, which could easily be counteracted by local cloud cover.

  Incidentally, the simple technique of painting roofs, roads and pavements white is considered by The Royal Society to be "*one of the least effective and most expensive methods considered*".[314]

  The idea of planting more reflective crop strains also looks promising, yet it is unclear how reflecting a greater proportion of the Sun's rays would affect primary productivity in plants. Side effects on market price, disease resistance, growth rates and tolerance to drought are also as yet unknown.

  Desert reflectors appear to offer an attractive option in principle, since deserts constitute 2% of the Earth's total surface area and experience very high levels of incident solar radiation. The ecological risks, however, of covering deserts with long-lived man-made material are cause for concern. So too are the potential impacts on atmospheric circulation patterns, such as the East Africa monsoon which generates rain over sub-Saharan Africa.[315]

- Another SRM technique involves **enhancing marine cloud reflectivity**. Preliminary studies show that many small cloud-condensation nuclei (CCN) scatter – and so reflect – more incident radiation than does a smaller quantity of larger droplets of the same total mass. This is because the surface area of smaller droplets is greater. It has been argued that smaller CCN will not only make clouds whiter but will also increase their longevity. This argument is by no means firm, though: Latham *et al* conclude that "*it is unjustifiably simplistic to assume that adding CNN to the clouds will always brighten them*".[316]

  Two issues which are central to the implementation of this SRM technique are "*firstly, the creation of a supply of particles of an appropriate diameter and quality to serve as CCN, and secondly, a means of distributing them*".[317] A potential, technically uncomplicated solution for the latter concern could be the release of hydrophilic (water attracting) powder from aeroplanes. However, in addition to numerous other uncertainties (such as effects on precipitation), *"[s]pray generators capable of delivering the desired quantity and size of droplets are not available commercially and numerous technical design challenges remain*".[318]

- Another idea is that mimicking volcanic eruptions by injecting **sulphate aerosols** (small particles) into the lower stratosphere could successfully scatter sunlight back into space. Sulphates are the most commonly proposed aerosol for this purpose, due to our past experience of volcagenic sulphate aerosols. However, *"[t]he analogy with volcanic eruptions is... imperfect; it is unknown whether slow processes in the climate system operating on*

longer time scales... would be more important in this quasi-steady state, compared to their role following a transient event such as an eruption".[319]

While sulphates are the best known category of aerosol for causing atmospheric cooling, artificially engineered aerosols could outperform sulphates: they could be longer lived, and could have a smaller impact on the ozone layer.

- A final method of SRM is the positioning of **shields or deflectors in space** to reduce the amount of solar radiation reaching the Earth.[320] Current areas of uncertainty surrounding this form of geoengineering are "*the design of the shields, where they should be located, how many are needed and by what method they are to be placed at, and maintained at, the chosen location*".[321]

  Due to the huge logistical demands of placing sun shields in space, this technology (whatever the details) would take several decades to be successfully implemented. However, once in place, atmospheric temperatures would respond within a few years.

In general, SRM methods would be likely to reduce global temperatures more rapidly and cheaply, but with considerably more risk, than CDR methods.

The potential for SRM to modify the Earth's radiation balance very rapidly means it could represent a useful means of avoiding a climate 'tipping point'. However, since SRM does not tackle the root cause of climate change (increased greenhouse gas concentrations in the atmosphere), it does not provide solutions to other negative aspects of climate change, beyond those associated with temperature. Ocean acidification, for instance (the formation of carbonic acid from CO_2 in the oceans, which attacks the shells and skeletons of marine animals), would not be averted by SRM techniques. Furthermore, under SRM precipitation levels would be unlikely to return to pre-industrial levels.

Within SRM, space-based techniques would be the more difficult and time-consuming to implement, but would have the benefit that temperature reductions would be fairly evenly distributed across the planet. Surface-based techniques and cloud-albedo approaches, on the other hand, would be easier to implement but would have localised effects.[322]

There is widespread consensus on the position of geoengineering within the much broader global climate change agenda. Lenton and Vaughan conclude that *"geoengineering is best considered as a potential complement to the mitigation of CO_2 emissions, rather than as an alternative to it"*.[323] Similarly, The Royal Society states that *"while some geoengineering methods may provide a useful contribution to addressing climate change in the future, this potential should not divert policy focus and resourcing away from climate change mitigation and adaptation"*.[324]

There have already been calls for a moratorium on field experiments with geoengineering, and there have previously been discussions under the Convention on Biological Diversity (CBD) to ban iron fertilisation field trials, except in coastal waters.[325] The law of unintended consequences is often invoked to argue that the geoengineering 'cure' could be worse than the climate change 'disease'. And in fact, there is a long history of deliberate human intervention leading to negative environmental consequences, as Matthews and Turner highlight.[326]

The idea that geoengineering represents a last resort option also carries significant governance implications. There is a strong argument that appropriate governance frameworks need to be in place *before* geoengineering techniques are further researched and developed. But why do so, if geoengineering might never be used, or used only as a last resort? There appears to be a risky *de facto* assumption that technologies could simply be rolled out in the event of a future climate emergency.

The Royal Commission on Environmental Pollution argues that we need to *"recognise the importance of continual 'social intelligence' gathering and the provision of ongoing opportunities for public and expert reflection and debate... if, as a society, we are to proceed to develop new technologies in the face of many unknowns".*[327] And The Royal Society also states that "*Public attitudes towards geoengineering, and public engagement in the development of individual methods proposed, will have a critical bearing on its future. Perception of the risks involved, levels of trust in those undertaking research or implementation, and the transparency of actions, purposes and vested interests, will determine the political feasibility of geoengineering"*.[328]

If geoengineering techniques ought to be deployed only in an emergency, as the Royal Society advises, it seems unlikely that inclusive and thorough public debate and engagement will be integrated within anticipatory geoengineering governance. Factoring geoengineering into future climate change considerations has significant implications for the future of democracy. Public engagement, equity and the exercise of power will be among the key issues to be resolved, with significant implications at both national and global levels. The balance between societal concerns and scientific evidence, here as with other areas of technological innovation, will be a key determinant of outcomes.

Technological innovation for democracy

In *Paper Three*, and in a separate paper written by Sally Hill,[329] we highlighted some of the relationships between technology and democracy.

Developments in information technology will certainly drive changes in democracy; for example as ideas of 'e-democracy' develop and the significance for the future of democracy of social network-based and other online communications evolves. One democracy analyst goes so far as to wonder whether the 'blogosphere' might be shaping up to be the new 'fifth estate'. Social networking and electronic participation are already revolutionising, and will continue to revolutionise, our ability to follow, support and influence political campaigns. Clem Bezold refers to the idea of 'cyber democracy' in support of governance. And in 1984, Italian political scientist Norberto Bobbio was already reflecting on the implications of 'computer-ocracy' for direct democracy.

The idea of 'e-democracy' (understood in its broadest sense as the multiple uses of information and communications technology in the processes of politics and governance) is among the principal drivers of change in the practices of democracy. However, the sheer rate at which information and communications technologies have exploded over the past two decades in particular makes it difficult to imagine the future of e-democracy. Very little literature ventures beyond the *current* disadvantages of and advantages of e-democracy into the uncharted realm of the future. As Steven Clift argues, *"The great unknown... is whether citizen and political institutional use of this new*

medium will lead to more responsive government or whether the noise generated by competing interests online will make governance more difficult".[330]

Hybrid forms of democracy could also potentially emerge, for the future, in a *biosociety* including '*transhumans, posthumans, cyborgs, clones, chimeras, and a wide variety of artilects and forms of intelligent life'*. Whether the impacts of climate change will unfold to accelerate, or to extinguish, these almost unimaginable possible future developments is an open question.

Other technological innovation

The characteristics of the next technology innovation wave will likely have a significant impact on *either* democracy *or* climate change; and potentially both. Consider the following emergent areas and characteristics of technological innovation:

- Geoengineering (considered above) could, *if* deployed quickly (and the prospects and possible side effects of speedy deployment carry very major uncertainties) head off the risk of catastrophic climate impacts. It could therefore potentially allow for non-catastrophic evolution in democracy.

- Nanotechnology; the science of the miniscule; could completely transform conventional economic activity from healthcare and renewable energy technology to food production. In common with other emerging technologies, including synthetic biology and robotics, the further development of nanotechnology could drive new public debate about risk and precautionary regulation and raises new issues of ethics and trust.

- Synthetic biology, which combines science and engineering to create artificial life or to force natural systems to behave in ways that are unnatural, will raise new ethical dilemmas that demand broader public debate, at least in democracies where information flows relatively freely. The creation of the first living organism, a bacterial cell, based on synthetic DNA showed the reach of the technology.[331]

- The convergence of information technology with other forms of technological innovation now means that innovation is no longer a top-down process. A World Economic Forum report notes that *"[d]o-It-Yourself biotechnology has a growing following, and work that used to require a lab full of people and equipment can now be done on a laptop"*,[332] with significant implications for public regulation of socially unacceptable technologies and products.

The prospect of a 'biosociety' emerging to replace the current 'information society' – or in combination with it - could, were it to see transhumans emerge as technologies converge, utterly transform democracy. For how long into the future might we allow only human beings to vote? And on what timescale will the *"national and global social, political and oversight frameworks necessary to ensure their effective development"* emerge?[333]

Democracy will also naturally continue to evolve whether geoengineering and/or environmental technologies are at the core of future technological innovation or not. The practices of democracy will certainly continue to absorb further the relevance of information technology and of virtual networks; with the role of political parties and the balance between leadership, transparency and

accountability, and the substantive boundaries of the *demos* in different parts of the world, constantly shifting.

Finnish futures writer Mannermaa, whose important work on the future of democracy was reviewed in *Paper Three*, draws strong links between technological development and societal development. He draws a picture of successive waves of societal development, including a shift from an agrarian era of 6-7000 years, to an industrial era spanning some 250 years up to the beginning of the twenty-first century. Over the first fifty years of this century, he shows rapid overlapping shifts into information society lasting some 20 years, shifting into what he calls a 'biosociety' driven by a further wave of technology; a society that will "*have at its disposal constantly developing new technologies that will enable the treatment of organic nature"*,[334] facilitating transformation of biological life. In turn, he sees biosociety shifting into a 'fusion society', in which machines contain living components and living creatures contain mechanical implants.

Mannermaa argues in effect, as we saw earlier and in *Paper Three*, that there are direct links between the technological characteristics of a society and its approach to democracy. For example, representative democracy, he argues, is linked to the industrial phases of development: its decision-making is hierarchical, with representative decision-making bodies keeping the machinery running by taking majority decisions. In contrast, the democracy models of the information age are likely to be based in networks rather than hierarchies and flexible and rapid change rather than rigidity and slowness.[335]

Climate change impacts

All of the drivers that we have just described have implications for both climate change and democracy. But what climate *impacts* could result?

Paper Four outlined the scientific evidence of climate change and its impacts, based principally on the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. We do not repeat its analysis here, though we draw heavily on it to describe our scen*a*rios.

Climate impacts to 2050 are to a significant extent already wired in as a result of global greenhouse gas emissions to date: even climate mitigation action taken now would be unlikely to have a very significant impact. Indeed, even without a further increase in climate forcing, further warming would be expected, amounting to a further few tenths of a degree Celsius by the year 2100.[336]

The possible range of climate impacts in the period from 2050 to 2100, however, is subject to a high degree of uncertainty. That uncertainty not only results from weaknesses in the quality of the scientific research on which the IPCC's Fourth Assessment Report draws, but also from assumptions (and associated uncertainties) in the projections for the underlying drivers of change (particularly in relation to technology, population and economic growth) on which the SRES scenarios are based.

Our democracy and climate change scenarios draw in more detail on some of the specific findings of the IPCC's Fourth Assessment Report which were outlined in *Paper Four*. We do not revisit the content of that paper here. But headline messages include that climate change will almost certainly bring large species loss, more severe storms, floods and droughts.

Climate change will also likely increase the transmission potential of infectious diseases such as malaria, dengue fever and water-borne diseases. As the IPCC's Fourth Assessment Report says, the health status of millions of people will be affected *"through, for example, increases in malnutrition; increased deaths, diseases and injury due to extreme weather events; increased burden of diarrhoeal diseases; increased frequency of cardio-respiratory diseases... and the altered spatial distribution of some infectious diseases"*.[337]

Sea level rise is the 'poster child' of climate impacts. Since the publication of the Fourth Assessment report in 2007 there has been a significant upward revision of estimates on global sea level rises, ranging from 0.75m to 2m by 2100, and with potentially devastating impacts on coastal communities. One suggestion has even been that a sea level rise in the order of 5m during the course of the 21st Century is yielded by revised modelling approaches that allow for non-linear rises resulting from melting of the Greenland and West Antarctic ice sheets.[338] In turn, it has been suggested that the tipping point for the collapse of the Greenland ice sheet is between 400 and 560 ppm; currently at the low end of scenarios for 2100.[339]

If the world continues to rely on carbon-based energy, *if* population growth continues at its current rate, and *if* 'dirty' technologies continue to be used, average global temperatures might increase by as much as 6.4 degrees Celsius by 2100; or 6.9 degrees Celsius relative to pre-industrial levels.[340]

Critical uncertainties

We highlight further, in a subsection below, some of the major uncertainties that arise out of the weaknesses of the Fourth Assessment Report itself, as well as some remaining research gaps. However, what is also striking is the number of areas where there are significant uncertainties arising out of climate models themselves. The most critical uncertainties concern various kinds of 'tipping points' or critical thresholds in ecosystems which could have dramatic and unforeseeable effects which are only incompletely factored into existing IPCC emissions scenarios.[341]

Among the most significant *possible* tipping points for abrupt climate change are:

- the possibility that warming of the sea might occur sufficient to release 'hundreds of gigatons' of methane from methane hydrates on the sea floor
- the potential for melting of the West Antarctic Ice Sheet, which currently sits on the (melting) Ross Ice Shelf. If that melted into the sea, sea levels might rapidly rise by 16 ft (more than 5 metres).[342]
- Acidification of the world's oceans triggering a process in which the earth's oceans become net carbon sources, rather than sinks.
- Possible collapse of the 'North Atlantic Meridional Overturning Circulation'[343]and the associated possibility of large scale changes in the circulation of the North Atlantic Ocean (popularly referred to as a risk that the warm Gulf Stream could weaken or reverse), which could bring a mini Ice Age to countries in Northwestern Europe including the UK.

Equally uncertain are the location and incidence of severe climate change-related events, such as catastrophic floods, storms, or a collapse in agriculture in one of the world's major food production hubs.

For all that one might imagine a severe climate event coming to be associated with a rapid galvanisation of public support for decisive action on climate change, it is likely to remain difficult, for the foreseeable future, to demonstrate clearly the links between individual events and human activities or greenhouse gas emissions. Over time however, as climate change-related disasters increase in frequency and severity, and inhabitants of vulnerable areas (including low-lying island states) experience at first hand the global climate change front-line; the impact of nay-sayers or even 'climate deniers' on public opinion might diminish, so that severe events have the potential to galvanise meaningful action.

Public trust in science and public attitudes to climate change more widely are among the key determining factors in the responses to these possible severe events. Will the dominant top-note be a series of weak responses to sub-critical shocks; a sort of 'democracy and climate change boiled frog' syndrome; a single decisive shock and a decisive response; or something in between?

What we know and don't know about climate change, democracy and governance for sustainable development

If one thing emerges clearly from all that has gone before in our work on democracy and climate change, it is that there is very little that we *do know* that can provide a robust basis for *predictions* about the future. At the same time, however much debate there has been about aspects of the Intergovernmental Panel on Climate Change Fourth Assessment Report, the *overall* body of evidence on which arguments for global warming is based have not been seriously shaken.

In the field of climate science, there is a great deal of uncertainty in some key areas with very far-reaching implications; particularly cloud and carbon feedbacks and sea level rise. At the same time, the ability of current models to simulate some aspects of climate change is limited. Below the highly aggregated level of continental-scale projections, there is little confidence in specific projections of future regional climate change. Scenarios for the future of democracy in the face of climate change must be necessarily generic.

Climate science is evolving rapidly: it's a moving target. The pace at which (and the credibility with which) it unfolds over the coming decades will itself in part determine the course of responses, in democracies, to climate change.

There are also some significant drawbacks in using the Intergovernmental Panel on Climate Change's Fourth Assessment report as a basis for the 'climate-related understanding' (as we have done) in a scenarios process on the future of democracy in the face of climate change. For example:

- baseline years; target dates and underlying assumptions are often left out of both technical and policy-maker summaries in the IPCC's Working Group reports.
- Probabilities and likelihoods are inconsistently presented and jumbled up.

- Many of the climate impacts 'projections' (sometimes mis-presented as 'predictions') are based on climate models which draw on the IPCC's SRES scenarios but without specifying which of those scenarios; or
- draw on SRES scenarios which are based on 'no additional policy measures or actions'; or are based on other considerations which are not spelled out.
- Methodological problems arise in other ways too across and within the different sets of climate scenarios. These range from the problems of Ricardian analysis of income effects of climate change, to SRES methodologies.
- The IPCC makes use of a bewildering number of types of data/units of measurement etc; presented in ways that make it difficult to draw out key policy messages.
- The IPCC considers mitigation options without assessing socio-political feasibility.
- The IPCC's assessments of mitigation and adaption options are *all* based on 'business as usual' economic models. The economic impact of climate change is to some extent assessed (in part). But there is very little on lifestyle change, for example, let alone cultural or values transformation working to generate mitigation options. In this respect, the IPCC tacitly assumes that radical change in forms of human organisation is not feasible. Many sustainable development advocates would also agree that there is simply not enough time to transform current economic systems within the window available in which to take effective mitigation action. (See further on 'time' below). But the omission of any serious analysis of behavioural or lifestyle change from the IPCC's reports to date is a significant gap. After all, it is behavioural patterns, along with current economic growth models, that present the most significant *democracy* obstacles to effective climate action.
- The IPCC considers how best to prepare for adaptation (development of adaptive capacities); but not preparation for mitigation. Yet our focus on democracy and climate change points to the need to invest in building effective *mitigation* capacity; including via a capacity to deliver long-term thinking and regard for future generations through the political system.

We had hoped that we would be able to take 2150 and 2100 emissions projections from the IPCC's SRES scenarios as a basis for our 'democracy and climate change' scenarios. However, there is a general problem in applying the SRES scenarios: they all assume that no action has been taken to implement the UN Framework Convention on Climate Change or the Kyoto Protocol.

The SRES scenarios offer conceptually inaccurate emissions trajectories for 2050 and 2100; particularly for a project that aims to consider *how* democracy *might* have responded by those dates – with the responses presumably exerting some impacts along the way. The report of WGII of the IPCC itself indicates that further scenarios are needed if the effects of mitigation are to be factored into climate change impact estimates. SRES scenarios *can* only offer ballpark numbers given that they are not predictions, and given the drawbacks of their key 'no-action' assumption.

Reliance on SRES scenarios is also methodologically weak on close inspection because the way in which the emissions data in the SRES scenarios is laid out is not helpful. Different units of measurement are used for different greenhouse gases, making it impossible to convert them to their CO_2 equivalents, or to read across consistently from projected emissions to projected impacts in the existing literature.

There is also the major global governance challenge of climate change adaptation and mitigation. The scope of the IPCC does not extend to evaluation of the political science base for effective climate policy, nor the political economy nor political science scenarios for climate action. The IPCC's analysis of adaptive capacity might be a good deal more useful were it to do so. And independently of that drawback, coordinated development of empirical analysis more closely linked to the political science, governance, political economy and behavioural economics and psychology implications of climate adaptation and mitigation, could provide a more systematic grounding for intergovernmental reflection and negotiation on policy responses to climate change.

Paper Four explored some of the potential links between determinants of democratic resilience (understood for these purposes as 'strong' democracy both as a political system and a system for social organisation) and determinants of adaptive capacity. But the state of research on adaptive capacity does not lend itself readily to such an exercise. And yet it seems clear that this is an area where further work is justified.

For all of these reasons, the scenarios that follow in *Section 5* take account of the IPCC's fourth assessment report, but have not rigidly followed its findings. Mostly significantly, this is because in each of our scenarios, at least *some* human or business behaviour is pressured to change over the time-span of the scenario (with impacts on climate change). We have made only the crudest guesses as to the effects of these changes on mean global temperature increases over time, but we have taken the SRES scenarios as our starting point.

The research and analytical gaps do not lie only on the side of climate science, nor even the understanding of processes of adaptation to climate change. There needs for example to be more reflection in the sustainable development literature on the future mix between direct, representative and deliberative democracy, and how in combination these could best deliver sustainable development. The idea – out of the democracy futures literature – that political parties now exist as separate from, rather than part of, civil society, is also an important theme for the future organisation of representative democracy.

There is also a very limited 'futures' literature on the future of sustainable development governance (as distinct from incremental proposals for change or historical reviews of political thought and sustainable development). Certainly, there is a significant body of 'democracy literature' which recognises the overall malaise under which contemporary democracy is struggling – most strikingly in Keane's *Life and Death of Democracy*. But that overall malaise was not factored into the 'future of sustainable development' literature reviewed in *Paper Three*, despite the link between democracy and sustainable development. That is a significant gap.

At the same time, there is an important overlap between 'sustainable development futures' and 'democracy futures'. Both tend, for a variety of reasons, to place emphasis on the future importance of subnational level decision-making; whether in virtual or real communities.

In the case of democracy futures (or just 'futures') this crossover is in part, for example, driven by the phenomenon of 'minoritisation'; Alvin Toffler's characterisation of a phenomenon in which minority groups swirl and form transient and novel patterns that seldom coalesce into a 51 percent majority.[344] In the case of sustainable development thinking, it is driven (in part) by the idea of 'subsidiarity' applied to sustainable development-relevant decision-making.[345] At the same time,

there is little recognition in the 'democracy futures' literature of the potential systematic threat to democracy that is presented by climate change.

In relation to global governance, it is striking that there appears to be relatively little 'sustainable development futures' thinking on the future of global governance for sustainable development. There is not, yet, a clear articulation of a vision of global governance best suited to sustainable development. Rather, those proposals that exist – e.g. on creation of a world parliament; or global interest networks, or global public policy networks – emerge from wider fields of global governance/international relations. On the other hand, the issue of climate change is attracting activists concerned to promote new forms of more democratic world government (e.g. Global Vote Now – screened at the Copenhagen Conference of the Parties; or the Cochabamba Declaration).

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5. Scenarios for 2050 and 2100

Introduction

Section 3 set out the rationale for adopting two axes for our climate change scenarios to 2050 and 2100 (reproduced overleaf, by way of reminder).

The approach that we have taken to developing the scenarios is a fairly simple one, in that the 'two by two' matrix approach that we have applied tends to push scenarios into extremes. However, even within the two axes that we have chosen there is still an extraordinary diversity of possible combinations and futures.

In arriving at stories from the future, we have viewed the scenarios as an exercise in story-telling, based on the drivers, tensions and points of principle identified in *Papers One* to *Four*. In determining what might be 'good' or 'less good' in a given future, the scenarios are guided by the indicative lists of criteria that were set out in *Section 2* of this paper. It is inevitable that there are a great many subjective judgments along the way.

The scenarios have a number of other limitations:

- They are notably anglo-centric. This significant weakness largely reflects the literature that has been considered in the research for this project. There is relatively little comparative democracy (as distinct from 'democratisation') literature that extends beyond Europe and North America for example. John Keane's work is one very notable exception. And literature on participatory decision-making in developing countries does not readily lend itself to a consideration of participation in the context of democracy as a *political* system; let alone how it might unfold for the future.

- Even now, climate research is very far from evenly distributed, politically or geographically. Much climate research is so highly aggregated that it is very difficult to connect it to the boundaries of political systems or to individual nation states beyond those that are the wealthiest, the most geopolitically significant, or closest to some of the most significant climate change processes (e.g. melting ice sheets). Given these biases in the overall literature that we have reviewed, it has been difficult in a mostly desk-based exercise to do justice to the possible future relationships between democracy and climate change that might be experienced by people beyond the confines of Europe, North America or the world's biggest or most rapidly developing nations.

- Consideration of the different drivers of change or their impacts is not evenly spaced within or between the different 2050 scenarios (much less the sketches for 2100). Rather, the scenarios seek to paint a *general* picture of the overall characteristics of the relationship between democracy and climate change. There are some facts that might plausibly be found in more than one of the scenarios. We have sought to minimise duplication whilst aiming to offer the essential flavour of each scenario.

- The scenarios refer only obliquely (in one of the sketches for 2100) to the possibility that climate tipping points triggering catastrophic climate change might be reached.

The *de facto* 'extremes' that the 2050 scenarios lead to are in no sense predictive: each takes the perceived reality of the present (including the aftermath of the 2008 financial crisis and the ongoing European sovereign debt crisis) as a starting point and seeks faithfully to arrive at the point indicated by the axes (e.g. high technology, individualistic values) by 2050. The result is that whilst the scenarios certainly allow assumptions to be tested and challenged, and the possible effects of combined drivers of change to be explored, they can be no more 'predictive' of reality than a good conversation in a pub with friends (if readers will permit the cultural specificity of the image). One particular problem in the case of the 2050 scenarios concerns the time lag between human activities or actions and their effects on the global climate. That means for example that the mean global temperature rise above pre-industrial levels already experienced in each is not different by orders of magnitude.

Starting points other than the present, in 2011, would lead to different futures. That is in a sense what the two 2100 scenarios explore: change over time and the possibility that some changes are cyclical or generational rather than linear. The technological or societal 'reality' of these scenarios can be no more than highly impressionistic, and that is why the 2100 sketches adopt a different narrative style and approach.

Each of the four 2050 scenarios takes the form of a 'voice' (or in one case two voices) from the future, looking back and reflecting on the society that she or he is in. One of the 2050 scenarios, 'rationed democracy', is different in narrative tone from the others: it contains reflections on what ordinary concerned people might do now, in the UK particularly, to ensure that the world that our narrator inhabits does not transpire.

In each scenario we have sought to consider the following questions:

1. What did democracy or democratic interactions and processes do to get us here?
2. What are people (and businesses) doing in this scenarios? (what are their attitudes and behaviours?)
3. What are the threats to democracy in this scenario?
4. How can democracy, democratic decision-making and institutions adapt to get the best out of this situation and keep the flame of democracy alive?

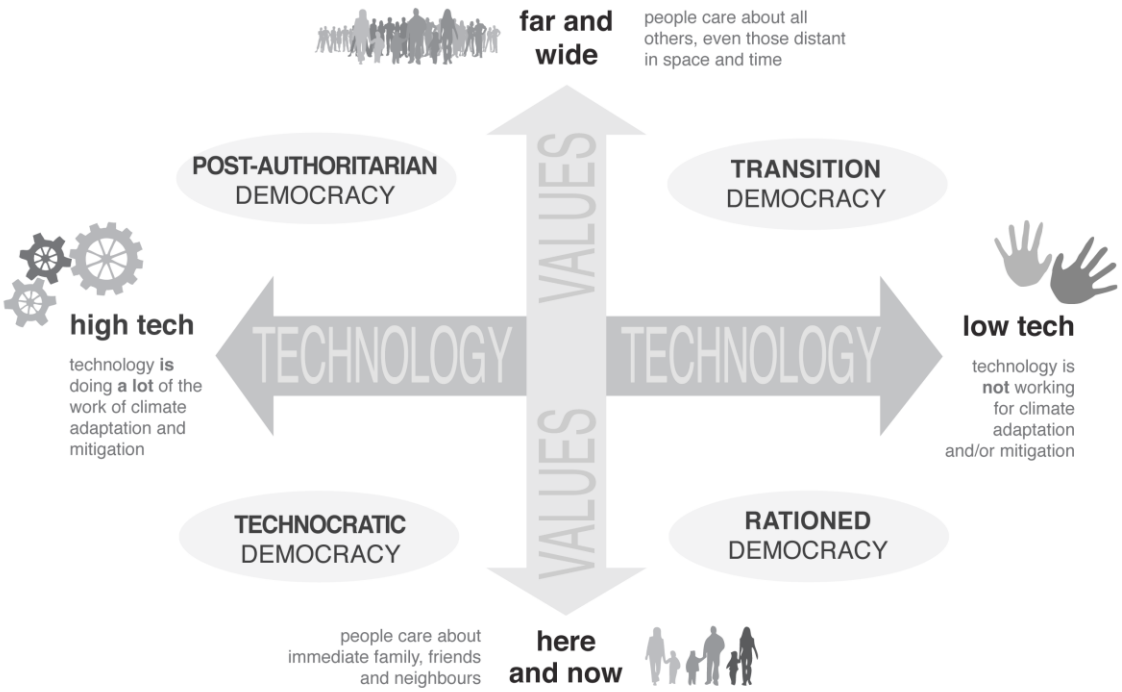
Each scenario seeks to respond to the central question: *how might democracy and participatory decision-making have evolved to cope with the challenges of climate change by the years 2050 and 2100?*

'Rationed democracy' is the scenario that is closest (for 2050) to the archetype of a 'collapse' scenario; and yet it takes the form of an address from the year 2050 by a newly appointed Minister for Future Generations, urging young people in the present to take steps now to avert the future from which she has travelled back in time. The scenario was (in slightly abbreviated form) delivered as a speech at a TEDx event on intergenerational justice and future generations (tedxyouth@thames) on 20th November 2011, Universal Children's Day.[346] In a sense, it represents a point of transition where 'rationed democracy' is rapidly suffused with a different set of values to those that have dominated thus far; it represents a point of inflection where the future might turn

from 'here and now' to 'far and wide' values. The storyline is a sleight of hand, since the scenario does not tell us whether other countries have reached similar points of inflection or values shift – but storytelling allows us that.

In the case of all but 'rationed democracy', each 2050 scenario is accompanied by a *Figure* highlighting key points in time and key characteristics of the scenario in question. Each scenario is also prefaced with a summary text box.

Figure 2 Democracy and climate change scenarios to 2050



Rationed Democracy

This is a world which did little to mitigate climate change, and has had to deal with its effects without developed adaptive capacity. Resource scarcity and climate refugees have led to a huge rise in nationalism and protectionism. Many countries have abandoned democracy entirely. Overcrowded cities are squalid, and lawlessness is rife. Central government has been scaled back and confines itself to administering rations to meet basic needs through a variety of external 'expert' agencies, each nominally headed by an elected representative. Community decision-making is fragmented, and whilst community democracy committees exist, they are unable to manage trade-offs between neighbouring communities; let alone the global impacts of their decisions. The UK has become a collection of islands.

Septima's story

My dearest fellow humans.

My name is Septima Tulisa. I have come from the future to be with you today – from the year 2050.

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Just three weeks ago in my time I was appointed Minister for Future Generations.

I join you today to offer words of warning, and words of hope.

This may be my only chance to speak to you, and yet there is so much that I cannot tell you. I am not permitted to reveal how I came to be here with you. I can't tell you how many medals China or India will win at the 2012 Olympics, nor who will win the Euro 2012 European Football Championship final – or even which city it will take place in. I cannot tell you your individual or collective destinies as human beings.

But I can reassure you: you have the potential to transform the future. You can affect *my* future as well as your own.

From my vantage point in 2050, and with the wisdom of hindsight, I and my fellow residents can see a great many things that should have been done differently.

Let me tell you a little about *my* world; where we stand together confronting the prospects of overcrowded, disease-ridden, lawless cities; useless infrastructure; wasted lives and squandered potential.

In my world, we look back and see that we waited too long to act.

We imagined that technology would deliver solutions to climate change, and many of us hoped that the climate scientists might have been wrong.

As the evidence of great risks to the earth's climate mounted, people – and their political elites – waited for technology to deliver; for great machines to be built to take control of the earth's atmosphere; for nanotechnology and the powerhouses of nuclear fusion to work their magic.

As citizens and as politicians, we were diverted by the pressures of energy, financial and economic crisis. We behaved as though getting out of the economic doldrums that gripped us was all that mattered.

Weakened by the recurrent financial and debt crises of the early twenty-first century we failed to invest public resources in technological innovation. Our politicians lurched from one short-term crisis to another.

With each failed global climate change conference and each climate refugee we became more nationalistic, more protectionist; more fervently a collection of *islands*. But so too did the nations that held the remaining fossil fuel resources; the oil, the coal, and the gas.

Shockingly, we had the crazy idea that alongside the technologies we wanted to see developed to build the world we wanted to live in; we could express our remaining altruistic values through 'responsible shopping'.

Nearly blinded by money, we forgot that our citizenship demanded real citizen activism.

There simply wasn't sufficient public demand to raise our sights beyond the short-term.

We claimed that as nations we still believed in the world's greatest political system – democracy – rule 'by' the people 'for' the people, even as other nations abandoned it. And yet in our malnourished democracy we failed adequately to vocalise our most urgent and powerful need – to hand on to our successors a healthy planet and the knowledge and skills to thrive upon it.

Then at the beginning of 2050, mass protests broke out. Five million people in our islands took to the streets demanding access to energy, shelter, work, and affordable food. There was violence, yes. And suppression of free speech too; but then that had long been a feature of our rationed democracy.

And from the midst of the chaos; a few devastatingly powerful words from a fifteen-year-old; a first-time voter, let us say. I cannot tell you her name – for she may turn out to be one of your children.

She climbed onto an upturned hoverbus in the Olympic wasteland.

Against all the advice from the protest organisers, almost universally heeded, she had left her communicator switched on. She sought no audience, but with tears in her eyes and anger in her voice, she asked, *"What happened to our future?" "Where's the intergenerational justice in this"?*

There was more, too, but I'm not permitted to repeat her words in full.

And this young woman's voice, from the frontline of our islands' protests of the Five Million, passed through the airwaves from person to person and into the consciousness of an entire nation.

It's hard to explain how one young voter's words can have had the impact that they did. When I prepared for this speech, I looked back a little at our shared history – yours and mine – and I can see similar moments in your relatively recent past; in those days after the death of the Great Princess Diana the First when people took to the streets with flowers; and in the days after the looting of your 2011 summer, when hundreds of 'riot wombles' brandished brooms and rubber gloves to reclaim their streets.

We are all leaders; and we are all followers; and at moments in time such as these, we can be both at the same time.

The change in my world after the riots of the Five Million wasn't instant, but in mosques and church halls, in temples and in pubs and in 'train the trainers' education hubs and in what is left of our community primary health centres, people began to put her question on the agendas for their meetings: *"Where's the intergenerational justice in this?"*

Up and down the lands of our islands, people began to ask themselves... 'How can we respond to her plea? How can we make intergenerational justice a reality?'...

Across our islands, people signalled to their Members of Parliament that they wanted national government to respond to their call for intergenerational justice: fairness for the present and into the future.

In the aftermath of the mass protest of the Five Million, people wanted to find ways to bring into being the feeling that they were all an intrinsic part of a common whole – now and into the future.

People stopped talking about the crisis of the moment; and Community Democracy Committees began to be spaces to ask important underlying questions: What is it that makes us human? What should we aspire to hand down to future generations?

People saw the deep connections between social injustice in their present and the huge injustice that they risked handing to future generations. People recognised that developing the capacity to pass down a healthy planet *could* have been what marked out their generation and the one before; that they had missed an opportunity; but that it was never too late to take action.

We realised that the sole job of leadership and governance was *not*, after all, simply to balance competing self-interests, nor to provide more goods, or even safety and security.

Like a hot wind whipping up the dusts of southern Europe, two old words began to be heard again: 'sustainable development'.

In my world, sustainable development had become discredited in the second decade of the twenty-first century. It became a phrase that elites used to try to trick people into doing what they could not bring themselves to do.

As the term began to gain ground once more, after the march of the Five Million, we returned to it and found in it a blueprint; a call to action for social and environmental justice grounded in democratic governance and intergenerational justice.

In my 2050 world, our national governments have latterly become little more than rationing agencies – a small core assisted by an array of external expert agencies parcelling out carbon budgets, food rations, public transport allowances and so on; not to mention managing the corruption scandals and the prosecutions that are the side effect of all the rationing.

The haves have, and the have nots don't.

In my world I've been an elected representative for some years. I'd previously been appointed to one of the rationing agencies myself. Our government likes to put elected representatives at the helm of these agencies. The technocrats and experts can get on with doing most of the work, and having an MP at the top helps the government to show that it is sustaining its commitment to democracy.

Many people in my world already take pride in their communities and what they have been trying to build for the future from the ground up; but with central governments mostly focused on rationing and security, we've lost the institutional means to connect policies across the barriers of fractured communities of engagement. We've got the information technology, but that hasn't proved to be enough. Each community continues to make decisions for itself without much regard to the greater whole.

And so – with grassroots demands ever more pressing – our Prime Minister announced a cabinet reshuffle. She announced the creation of a new Ministry for Future Generations; an entirely new Ministry, not just another expert agency; A Ministry to demonstrate the government's commitment to bring the needs of future generations to the heart of government and the practices of democracy, from central government to the local level; with a position at every rationing table and a right to

intervene as advocate for future generations in any relevant local or national democratic decision-making process.

My Ministry started work three weeks ago in my world. We're in a good position now in 2050 to pull together as a collection of islands. The public is firmly behind the government. But we left it far too late. Things are getting worse.

And why me you might ask? Why am *I*, Septima Tulisa, the Minister for Future Generations?

I wasn't the seven billionth human being on the planet; but I was born on that same day: 31st October 2011. And so my Prime Minister felt that at a time of generational transformation, my appointment might provide not only leadership, but also a symbolic link between past and future. That's why one of the creatures in my Ministry's logo is a phoenix – rising from the ashes. And it's why I've come to talk to you today.

I've sounded my warning. But what can I leave you with? What *must* I leave you with? Some insights, and some suggestions for action.

When I started to prepare for this speech, looking back to the time of my birth in 2011, I found that plenty of people had been thinking about the needs of future generations long before the Five Million marched. And I asked myself – why on earth didn't *they* set up a Ministry, or a Commissioner, or a guardian for Future Generations when they knew all of this?

I looked back in time and saw huge investment in environmental laws, and institutions, and policy initiatives to tackle poverty and build a less unequal society. And I can see that in your day, intergenerational fairness is already on the agenda. Some of it seems to me to be just words. I'm not saying that a Ministry for Future Generations should be the way forward for you, though it is right for my government, in my time – but any government commitment towards long-term thinking needs to be linked to institutions designed to take account of the needs of future generations; not even a clear sustainable development strategy.

I've found records of a UK Alliance for Future Generations, which began its work in 2011. And I read about the pioneering Hungarian Parliamentary Commissioner for Future Generations.

My point is that the seeds of hope are there. I can't give you the detail – but just make it the job of your politicians to safeguard the needs of *all* people, present and future and hand on a healthy planet, and the rest will follow.

People know, deep down, that what they hand down to future people defines *them*. But too often your leaders – elected and unelected - seem to behave as though you want only what is best for your short-term gain. Show them that that is not true.

Until change comes genuinely from the will of the people; it cannot and will not be enough to exert the consistent push; the ongoing processes of discussion and reflection that are needed to put us on a path to sustainable development. It will be unstable. That's what we found. So make it your business to play a key part in expressing the will of the people.

Your leaders will not do this alone. Show them that they would not be alone.

Re-write the job descriptions of your leaders. Send them the new job descriptions.

Write to your elected representatives and tell them that you want to see the needs of future generations built into government and policy processes. Tell them that future generations don't just need a thriving economy. Ask them what they are doing to take account of the needs of future generations to inherit a healthy planet and the skills to thrive upon it.

Use your economic crises to build a green and fair economy. Not just the pale 'business as usual' add-on that I lived through; but a genuinely green and fair economy, from top to bottom.

Be a local guardian for future generations in your community: go along to your community's local meetings and get involved in the online forums. Speak out about the *history* of your neighbourhood and what that shows about the needs of future generations; ask others to take future generations into account. People will listen because you are likely to be saying things that deep down people all know.

I'm not saying it's easy. There are difficult balancing acts. But do insist that local issues aren't dealt with just by dumping problems onto neighbouring communities, or countries, or future generations without even thinking about them. Insist that everyone counts.

You have a voice. Please use it – for the sake of my future and yours.

2011, and the coming year, 2012, offer a period of powerful awareness of the danger that lies ahead and unique insights into what must be done. I *am* permitted to tell you that. People are questioning blind materialism and asking searching questions about the future health of the planet. In 2012, there will be a major UN Conference on Sustainable Development.

You are at a point in time when *you* could create institutions to bring the needs of future generations into the heart of your society.

So seize the year. Don't do what we did in *my* future and leave it too late.

Time is short. Let me conclude. When I leave you and step back to the year 2050, I will know immediately if you have chosen to act on the insights that I have brought you today.

If you take *any* action as a result of hearing from me today, I *know* that the world that I walk into in the future, on my return to 2050, will be better than the world that I left behind to come here today.

Thank you for listening.

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Transition democracy

This is a world that has witnessed a massive shift in values triggered by the aftermath of financial and sovereign debt crises. The early years were difficult, and there was significant unrest and a rise in 'guerrilla' movements as public investment was withdrawn. Our narrator speaks from a country with a substantially reformed constitution and decision-making processes. The accent is on community-level decision-making, and whilst local government appears absent there are plenty of opportunities for local decision-making to drive national engagement. Businesses have become hubs for democratic engagement and work for social goals. Global governance has also evolved to allow greater opportunities for direct citizen engagement, particularly through mechanisms for multistakeholder expert groups to contribute alongside governments. Intergovernmental decision-making is now restricted to a few key areas. There is a real possibility of a mean temperature rise of three degrees Celsius by 2100. And there are also significant questions about whether shared values and community cohesion will survive the rationing and the increase in climate refugees that are on the horizon.

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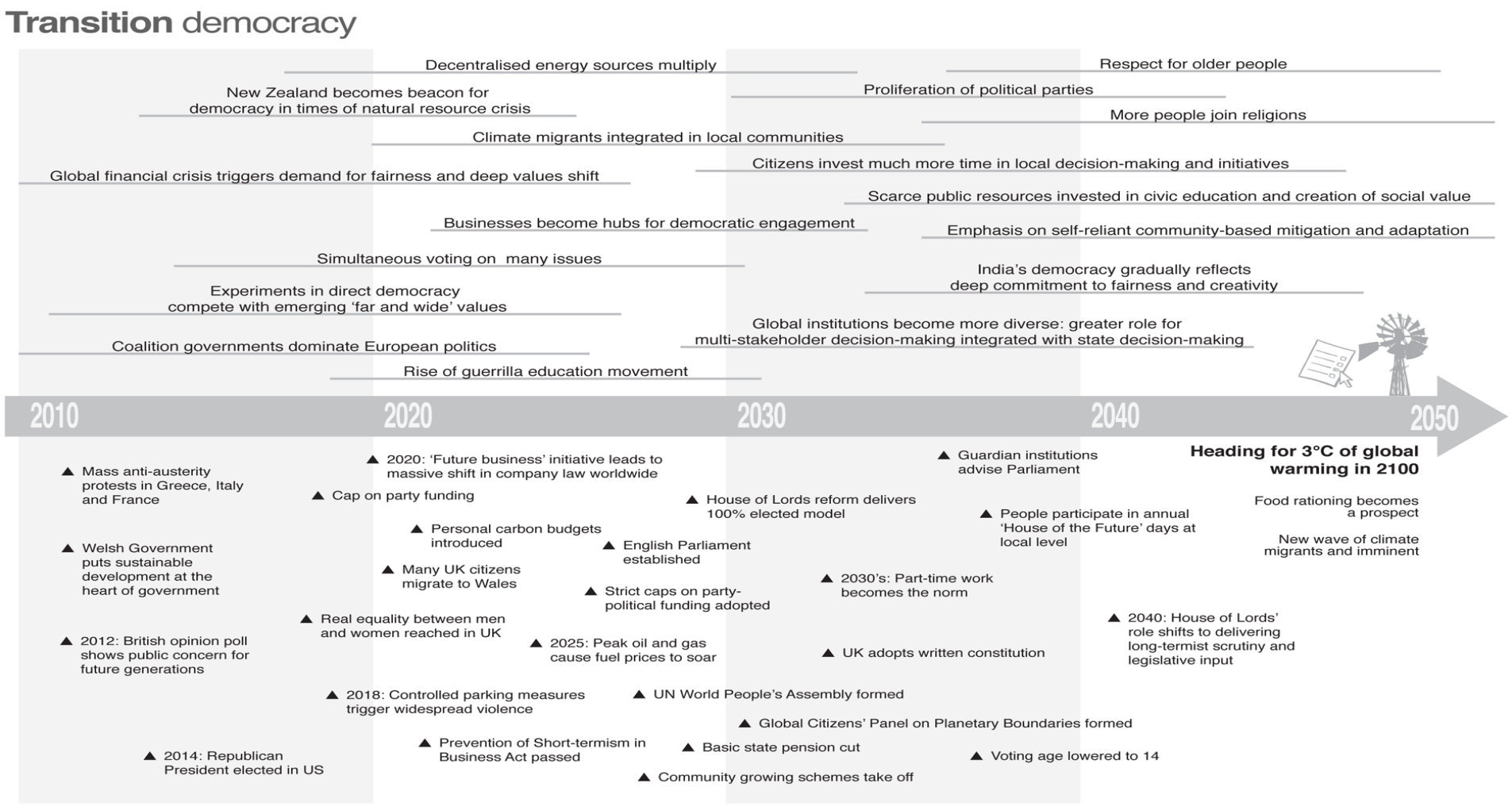
Figure 3: Transition democracy



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Frances's story

Overview

I suppose that these days I'm a low-key activist – but all that really means is that I recognise my responsibilities to engage fully in real and virtual decision-making as a concerned resident and citizen.

I've been working in not-for-profit organisations for most of my adult life: first grant-funded charities, but then I decided to try out what might be possible through the social enterprise model, and as a result of that I became quite heavily involved in the 'future business' initiative of the 2020s, which led to massive shifts in company law around the world.

As to climate change, prolonged recession and financial crisis in Europe has kept global mean temperature rise to around two degrees Celsius above pre-industrial levels, but three degrees still looks quite likely by 2100. The world's economies are far from based on 100% renewable energy for lack of investment, sadly. The good news is that we've seen a massive swing towards values associated with fairness – initially out of Europe, and then near-enough globally. There's an emphasis on local level, community-based decision-making; but national democracy has also been reformed quite significantly, and there are plenty of opportunities to influence national level decision-making too. The social pressures are great, though, and with food rationing and more climate refugees an imminent prospect, it's hard not to worry about whether our current values will hold up.

Global governance

With the UN Conference on Sustainable Development on the agenda in 2012, and a big debate about how to get the global community to deliver sustainable development and a green and fair economy; a really big discussion started – OK, initially among global elites or people with access to the internet or newspapers – about what we expected of our international institutions.

The old international institutions of the United Nations, or at least their ways of working, are a distant memory now. They were so far behind the times. Aside from anything else, they had no real idea how to go about real engagement with members of the public. All those rules and hurdles before you could be so much as permitted to engage, even if, as I did, you worked for an international non-governmental organisation.

There's a World People's Assembly attached to the United Nations: the massive aftershocks of the financial and debt crises early into the 2020s provided such a jolt to the old system that it opened up the political space for the additional public engagement that was implied by creating such an Assembly. The Assembly somehow didn't quite work to really democratise the UN though: we've still not fully worked out how to connect it to the grass-roots level, and it's a bit of an elite body. That's odd in a way. But I suppose it's probably because it's left over from some of the older ideas about democratising global governance; before we worked out how to link multistakeholder decision-making to the role of states.

There's also a Global Citizens' Panel on Planetary Boundaries which brings together a mix of scientists and ordinary people, working together to come up with recommendations on where to set the environmental and social boundaries. The problem is that, given the scale of the changes that are, even today, needed, the result is a bit of a mismatch between global level recommendations and action at the national and local levels. I suppose that in a way we've lost some of the old capacity to make big decisions via governments. Perhaps if we'd seen more technological innovation over the past few decades things might be different – the technology might provide part of the glue between the global and the national. I don't know really, but I do wonder about that.

A lot of the really progressive work of 'global governance' is now done through quite sophisticated multistakeholder networks in the world's standard-setting bodies. But we've still got some government discussion forums in those areas where decisions really do have to be made at the level of nation states – military security and immigration permits, for example.

We've got much better at consensus-based, open source leadership at the global level too; sharing our skills rather than relying on any sort of cult of individual leaders. There was a period when there were some uncomfortable glitches; where governments and nation states really struggled to accept the fact they were just one stakeholder among others, but a few of the key institutions worked out some basic rules of engagement, and today governments are a stakeholder like any other, save that it's they who often need to act on what emerges from the multistakeholder networks, at least if it's laws or taxes that are required. In some other areas the other participants defer to them for initial advice, too.

There's a bit of a struggle just now to try to get Mandarin adopted as the first language of these networks. I think the compromise will probably be that people can use English, Mandarin, Spanish or Russian (which is important because of Russia's natural resources).

At global level we now have quite good ways of ensuring that local communities' insights drive decisions. We've also managed to mesh geographical and thematic interest groups. The sheer size of the population – plus the fact that we're using every bit of spare housing space – means that we're much more mixed up than in the past. And anyway, people by and large have stopped regarding other people as enemies. We care much more. We're all in it together.

Geopolitics

The US was initially, if I can put it this way, something of a disaster. In the Presidential elections of 2014, the Republicans got in again; but the US was now so out of step with Europe that it seemed increasingly isolated. On the other hand, even though the US economy was a behemoth, everyone knew that it was really China that counted – and increasingly so. Gradually though, there was a certain cultural respect for Europe in the US (it really turned out that it was there, underneath, all along) which meant that the shift in European values – towards fairness and equality – began to have an impact there, too. Through social networks, it was pretty apparent that the contrast between the quality of discussion in the US compared to Europe was quite jarring. Today, there's even a debate about constitutional reform in the US, to bring collective rights and collective responsibilities into the constitution. The first amendment could eventually be a relic of a former age.

From here in Europe, whilst we could see a great deal that we didn't like about China – its approach to public participation and engagement for a start – there were also some things that were genuinely positive. That long-term regard for the welfare of the nation as a whole was something that we could readily admire from afar; but then we weren't close to the day-to-day reality of the corruption and the political deals; the suppression of human rights. China was hugely difficult to hold back; and nor should she have been.

India initially became something like the new nightmare of lowest common denominator majoritarian democracy, with a rapidly growing and vociferous middle class who kept voting against anything that didn't suit them. But there was so much scope there, too, to work to amplify peoples' underlying values as humans. After all, the experience of Gandhi hadn't been so very long before. And there were so many people who had a recent memory of being poor, or who were still very poor, that even there there was gradually a shift towards a public rhetoric of fairness and equity. The idea of the 'common man' became less patronising, and more a positive image of the nation's effort to strive for outcomes that reflected overall fairness.

The values shift

The sovereign debt and financial crises of the early twenty-first century really transformed public opinion in many countries of Europe and in the US. In Greece and Italy and France so many hundreds of thousands took to the streets: to protest at austerity measures. For sure that was partly because of the impact on them as individuals. But the protests were also an expression of the pain of entire nations – of the most incredible anger at what had been going on behind the scenes for so many years – the manipulation by a political elite; the control of peoples' destinies by financial markets. New spaces opened up in which people saw that the main priority really had to be pursuing shared wellbeing.

People were simply completely and utterly fed up with what they saw as fat-cat bankers and all the other people oiling the wheels of a finance sector that might be a third of the country's GDP, but was also rotten to the core. Fed up of being lectured to about how we could make up for the huge withdrawal of national government support and funding by volunteering in our local communities, people became more politicised. Buoyed by opinion poll results and the increasing evidence of sleaze and short-term profiteering at the expenses of peoples' nutrition and livelihoods, people started to organise themselves.

We were at a point of inflection. Politicians had for some time – no doubt linked to the rise of social media – found it quite hard to raise clear majorities in favour of any particular action. The affluent boom years had meant that a majority was well-fed, warm and healthy. Only a minority was struggling. But the financial crisis and the sovereign debt crisis changed that. Far from a nation of 'minorities', all the people who were suffering the effects of high fuel and food prices, tiny returns on their savings, the people in fear of losing their jobs or struggling to find jobs – together, all these people made up a new majority. And remarkably, what emerged, far from a majority in favour of having as much as the bankers and leaders of finance houses, was a majority in favour of that old-fashioned thing – *fairness.*

In Britain, an opinion poll in the Autumn of 2011 showed that the public really did care about future generations. Some pundits dismissed it; arguing that it was just another example of how the public showed concern but wasn't willing to do anything about it and expected politicians to make all the tough decisions for them. 'Cognitive polyphasia', someone said. But something in that poll really chimed. Further research showed that people really did mean it – opinion polls had just rarely asked about these sorts of underlying things before. The questions had been too driven by mainstream consumerism and the day to day grind of adversarial politics.

Values of equity and fairness, rather than individualism, started to take over. We hadn't really had to confront environmental crisis at that point (perhaps there wasn't enough environmental protection in the mix, with hindsight) but the shift to human wellbeing rather than human acquisition was the most fantastically exciting development. We quickly saw real equality between men and women – though other forms of discrimination took much longer to recede.

In smaller nations – Wales was one of them, but there were others too – some really pioneering initiatives got under way. People started to see what it really meant to make sustainable development 'the central organising principle of government'. The subnational level started to matter much more, and whilst we never quite got to a point where any one of the nations seceded, we did eventually get an English parliament, (we are still a United Kingdom, just about!).

Far from the usual sort of consultation exercise, what happened in Wales amounted to an invitation to a nation to engage in shaping a positive vision of its future. There wasn't a lot of cash to spread around, of course, but in that particular context it was possible to have a really serious conversation about distribution of what already existed. Of course, the nation had to cope with a major influx of people from elsewhere in the United Kingdom; but the new structures that were emerging to allow for a sort of second-tier democratic engagement by virtue of 'residency' or membership of particular 'interest groups' started to acquire quite a clear shape, alongside the established means of participation for people with voting rights in formal elections.

In New Zealand too, weakened by the economic and democratic fall-out of massive earthquake and its thousands of aftershocks, people already recognised that democracy was part of the glue that held their quality of life together; those carefree days before the mud and dust of earthquake destruction had been exchanged for something not only more depressing but also more sinister. The nation emerged from its crisis with a much stronger sense of democratic commitment and engagement; and the extreme nature of their experiences meant that New Zealand quickly became a kind of beacon for the emergent qualities of democracy at times of great stress.

With high fuel prices and rocketing food prices too, we all started to think much more about 'future generations': not just, literally, those who hadn't yet been born; but also about all the areas where there was systematic inequality between one generation and the next; between younger and older people, for example. The major problem of youth unemployment, in particular, coupled with the realisation that there would be very limited public resources to care for a rapidly ageing population, really focused the mind on intergenerational unfairness in the present. And there was quite a bit of conflict – real physical conflict – at first as part of the overall values transition.

Despite the stagnant economy here in the UK, people began to reflect more deeply on the possibility that climate change might be a reality with huge social impacts. There were increasingly concerning scientific developments – destined to inform the 2014 Intergovernmental Panel on Climate Change report – being reported regularly in the media. And civil society began to be much better at reaching people who were already struggling.

An influx of leading environment and society journalists to a couple of the big dailies (*The Telegraph* and the *Daily Mail*) supported the shift in values. There was still plenty of climate scepticism – but people started to be much less tolerant of the old 'trolling' ways in which some of the debate used to be expressed; the venom of online forums and newspaper comments strings gradually subsided and what was left were enormously vibrant spaces for public discussion. Journalists started to view their role, very directly, as being about instilling a sense of active citizenship, rather than reporting to suit the whims of a predominantly consumerist culture. Some people didn't like it of course; but the whole process was supported by the democratic outcome of the decision to bring in tougher regulation against short-termism in business.

There were many obstacles to overcome though. A substantial minority (if I can put it that way) thought that the best way forward was much more direct democracy: rights of recall; referenda; the crude outcomes of online polls about bringing back the death penalty. It took a while for the new values of fairness and equity to embed themselves sufficiently that there *wasn't* conflict. The period up to about 2025 was quite rocky.

So many European countries were stuck with fragile coalition governments that there was actually plenty of space for real people-powered innovation from the bottom up, too. All the old elites had been destabilised (though they certainly hadn't disappeared).

The state of national democracy

Our elected representatives are really catching up with the reality of the urgency of tackling climate change now. They didn't manage that, in that crucial second decade of the twenty-first century when we could have guaranteed stabilisation at two degrees centigrade above pre-industrial levels. We're looking at three degrees by 2100, apparently. I'm quite worried about supplies of concrete and timber for sea defences. There are already some evacuation plans in place, and many low-lying areas have been abandoned already, but there's a lot more trouble still to come. I'm just thankful we're not living in one of those huge coastal Asian cities. I really feel for those people.

We've not managed to play catch-up fast enough here in the UK either, I'm afraid. We've already got tough personal carbon budgets, and I think we probably will see food rationing too. National government resources are really directed towards securing the things that we're going to need to carry society forward into a badly climate-affected future.

We're also preparing for massively reduced public spending – even more than so far – on things like health care. A lot of our education spending is about to be redirected, too, towards civic education and basic skills to meet primary health and nutritional needs. It's schools that are really the incubator for the civic engagement of the future. We're basically spending much less at the various national levels on public services in the old sense and much more on democracy; strengthening civil

society; and creating *social* value. The idea is that if we all have a really strong shared sense of values and of our responsibilities as citizens, we'll be able to organise ourselves at local level to deliver solutions to all the things that life throws at us.

We find that these days, political parties do a lot more 'horizon scanning' – across all the social media, including the new forms, which are basically anonymised 'thought exchanges'. And there are lots more political parties now than in the old days. Some of the newer parties have developed really different ways of working, too. One of them, for example, invites people from any walk of life to apply to stand as an elected representative. They advertise against a job description. I really like that: it's opened out the whole process.

There are strict caps on party political funding – the maximum individual donation is £12000, which really isn't all that much in this day and age. But fundraising through social media has become much, much easier. It's so easy these days to donate to political parties through shops or even online when there's a vote in parliament or national and local assemblies.

Parliament's got a lot better at really engaging with people, too. Everyone knows that democracy is about so much more than voting. We eventually found ways round all the early glitches with 'crowd-sourced' consultation on the internet. What an embarrassment some of them were. No, today, Parliament's definitely modernised – and here in the UK we're still in the Palace of Westminster, and it's one of the few heritage buildings that has really benefited from some of the scarce energy efficiency grants that are around.

When I think of all those rules of procedure in the old days that only really served to keep political elites distant from the people they served... Sometimes, pieces of legislation would *literally* be kept off the statute books because MPs would just read out poetry in the time slot that was allocated. It was really shocking.

We've opened up *voting* rights here in the UK – and many other countries have followed suit. In the UK, we had to. For a start, with the population now so swollen, and an ageing population at that, the younger people who are really underpinning the success of our society didn't have enough votes. They were easily outvoted by the oldies, and we saw a real risk that us older people might simply vote to make life more difficult for the younger people who sustain us. So we lowered the voting age to 14; and it's made a real difference. There were some peculiar decisions in the early days as a result of course (decisions on access to high calorie foods; recreational drugs; prohibited literature), but they're in the past now.

There's a lot of respect for older people too, because it's my generation who really made it possible for the big shift in values that we saw about thirty years ago to really take off.

We've also developed a whole new set of, well, I suppose 'guardian institutions' who exist to advise parliament – and I do mean parliament rather than government. Parliament's much more important than it used to be; partly because we find that we so often have coalition governments these days. We're also finding that parliamentarians are taking their roles much more seriously.

In the early days we tried out an 'ombudsman' model; a series of people whose function was to make recommendations to parliament – across its legislative and scrutiny functions – so that certain interests would be adequately factored into decision-making. We also, finally, developed a written constitution around the same time, though we've never collectively felt bothered enough, I suppose, to become a proper Republic. It's an anomaly, you might say.

The old House of Lords has been reformed. Initially we went for a 100% elected model (without the bishops and judges, I might add). But in reality, not much had changed apart from making it 100% elected. People couldn't really work out the difference between the Lords and the Commons because the functions of the Lords hadn't changed. But more recently – in 2040 – we made a shift. We weren't the first, of course. But it's basically the job of the House of Lords to do the really long-term prognostication. They choose a time-frame appropriate to the issue under discussion.

Community democracy

Out of the early chaos, people who could afford it started to get together at community level – to do things in spite of the government, rather than with it. Later, some people broke into boarded-up libraries and started running literacy classes, book groups, and computer training – a whole guerrilla education movement sprang up, and it turned out that pretty much everyone could bring something to teach other people about. What's more, with the lack of budget and resources at local level, there was a real recognition that we all had a civic responsibility to do our best to help our neighbours and share skills – even in quite heterogeneous urban areas.

Today, we've got much better, as a nation, at building consensus – making inclusive decisions and making sure that we mull them over really well first. Pretty much every community has at least a couple of trained facilitators, and we're all getting used to making decisions with our neighbours (and not taking it out on them afterwards if we're not completely happy with what emerges!). A lot of the meetings can be really fun, too. We've really come a long way from the spate of 'controlled parking' violence that swept the nation around 2018. That was before electric vehicles had properly taken off and the costs of owning a car were really shooting up. Local disputes about parking were a bit of a flashpoint.

We all need to be self-reliant – at the community level I mean – when it comes to mitigating and adapting to climate change. There's just not enough cash to go around to go for anything more high-tech. By and large we still get support from national government though, in the form of the raw data that we need to inform our decisions. Everyone – pretty much – has bought into the idea of precaution when it comes to taking risks with the planet or society.

I suppose you might say that whilst our hard technology for dealing with climate change and all our other societal challenges hasn't evolved hugely, our *social* technology has come on in leaps and bounds. And of course we've become *so* much more sophisticated when it comes to sharing information across communities. Lots of pioneering communities in the UK and elsewhere started early – even developing 'energy descent' plans in the early days of the Transition Town Movement. But those efforts weren't nearly as inclusive as they should have been, save for in some of the poorer countries in Asia and Africa where farmers really started to take control.

Once a year now, everyone is paid a people's allowance for the day so that they can participate in their local House of the Future: it's an opportunity to come together to think through the impact of what we're doing on future generations. We can all do that, but nominated 'local guardians' also give really inspiring presentations.

The new constitutional settlement was really an opportunity to think through how, for the whole of the United Kingdom, we might manage a proper working system of subsidiarity – so that decisions are made as close to the local level as possible. We've now got fairly sophisticated checking mechanisms for our local decisions: fairly speedy ways of finding out whether what is proposed at local level is going to adversely affect people in neighbouring communities (in which case we can form small transboundary groups to work out those issues), and also of checking in on how whatever's proposed at local level.

Technology for mitigation

We find ourselves now, though, in a situation where it took too long to turn round the global financial system. We did get it – but too late to halt the next generation of infrastructure investment. So a few of those nuclear power stations did get built; and the coal-fired power plants. Eventually though, in the UK and many other countries, it became apparent that nuclear power really couldn't be sustained without massive public subsidies that simply had the effect of shifting the burden of dealing with nuclear waste to future generations. It was better late than never.

Despite the widespread shift in values, there really wasn't enough money going into smart grids, and very little public money spare to underpin investment in renewables on the scale that was really needed. Basic research and development were supported once governments had understood that people really did want them to invest in long-term social and structural transformation, with a view to creating the innovations necessary. But there was far too little take-up of the possibilities within the energy, construction and transport sectors; initially at least. All this meant that the new knowledge and new capabilities could not be exploited widely. Some niche developments did go ahead but economies of scale couldn't kick in to bring prices down to a level that would enable mass roll-out.

Peak oil and gas really bit around 2025. Somehow, though, the effect was softened. Yes, we had to pay a really high price for our light and heat, and not everyone had access to decentralised energy sources. But we'd been planning for it for a little while after the controlled parking violence, and we'd got used to the idea of saving throughout the year for our winter bills. What was more remarkable, in a way, was that the countries that held the remaining fossil fuel resources *themselves* recognised that whilst there was a price to be paid, those natural resources were the common heritage of all of mankind.

Immigration is making up some of the shortfall – though that's generating the odd flare-up of tensions when it comes to voting rights. And since the basic state pension was cut back, many more people have had to rely on old-fashioned soup kitchens, though there are plenty of them around if you're lucky enough to live within walking distance of one of the community farms.

All sorts of people are doing their best to mitigate and adapt to climate change based on the technologies that are already available; but there's not really been any disruptive, or even any widespread technology-roll-out. I'm glad about that, mind. There's actually plenty of technology to go round already in my view – we just need to find ways to make sure that it's fairly distributed and ensure that the older technology gets fully upgraded to non natural-resource-intensive production and consumption cycles.

How we live

We can't really rely on public sector investment in innovation or even private sector innovation from big business to do the job of climate change mitigation and adaptation for us. We have to look to our lifestyles. The bi-annual announcements on the nation's performance against 'well-being indicators' are hotly debated, since they're still far from perfect. Many people think they're much flakier than the old GDP metric, even though they measure completely different things to the old measures of economic activity. We're having fewer children of course, though it's hard not to feel bad about the burden that places on the younger generation.

People are trying out all sorts of small-scale, local solutions and sharing their learning globally across communications networks. There's a real groundswell of grass roots action. At the same time though, it's not going to be enough to cope with the hard reality that it will really take concerted and coordinated and well-funded activity to decarbonise the energy system. Yes, we've made some progress. But we really did need investment, I suppose, to optimise our economic system to deliver sustainable development. Emissions reductions aren't as significant as they might have been.

A lot of people are doing what they can to bring down emissions: there are very few homes in single occupancy now, for example. Hardly any spare bedrooms in cities. Even the 'old rich' have been shamed into renting out spare bedrooms.

We've done much better when it comes to adapting to climate change. Because the impacts of storms and floods and so on are really felt at a local level, all of those community-based activities have really kicked in. We've also really learned how to make the most of the communications systems that we've got. One thing I'm particularly proud to have helped to set up is links between community growing schemes in the North-West and the Village Sustainability Movements in Latin America. Of course, the Village Movements are very much in a minority, because most people today, around the world, live in cities. And today's community growing schemes aren't really like they used to be forty years ago. A lot of the green space in many of our cities has been built on – inevitable really, with population growth. We had to go through a whole national process of engagement to work that one through.

At any rate, today, we're really making the most of all the vertical growing possibilities that our cities have to offer. Balconies, roofs, terraces. We've got urban oyster and trout farms and all sorts of growing schemes. I'd say that pretty much everyone knows how to make best use of city fruit trees – though we've had to parcel out access at community level much more than we used to. As a result, despite the loss of green space at ground level, biodiversity's thriving. Well, it's a different biodiversity to in the old days, and we've lost quite a few species to disease and, in any event, to extinction as a result of climate change. But overall, it's OK.

One side effect of the real recognition of the urgency of adaptation is that we're doing much more on the basis of an ecosystem-based approach. In other words, the boundaries of natural systems, and the services that ecosystems provide us with, are much more significant in setting the terms of local discussion and, sometimes, even the boundaries that we use when we vote.

Today though, because most people who work have part-time jobs (there was a mass downsizing in the 2030s) and people's home loans are so much smaller these days than they used to be (and there's tough fair rent legislation in place too for the majority who don't own their own homes); we've got more time to spend with one another. It's not the chaotic early days any more, thank goodness. These days, we've worked out how we can take account of expertise and ensure that we bring it into the picture without having to turn to a sort of 'dictatorship of experts'.

We've certainly not gone back to the dark ages either. We're able to communicate much more cooperatively than in the past, and we can use really efficient solar batteries these days. We can't travel physically so much any longer, but we are able to use communications technologies to stay in touch.

I haven't said anything about religion yet, though I did mention that the bishops have gone from the House of Lords. So in that sense our democracy has become more secular if anything. But not our communities. Because of all the huge social transformations people have been through, there are a lot of religions that have really grown in popularity. Buddhism (the Dalai Lama is Spanish). Paganism of course in its various forms as people have realised the folly of the idea that humans are somehow separate from nature, rather than part of it. And Hinduism has also really taken off in the UK too. We often hear elected representatives appealing to religion, or at least faith-based values, to justify tough decisions – particularly those that really reflect on the failure of the old values based in consumption.

Some people have naturally turned towards more austere faiths, fearing for the future, and there are quite a few survivalist sects that we don't see much of behind the big fences they've built around their communally occupied country piles. There's been a real flourishing of more moderate forms of Islam too – spread from the East, from China and Central Asia rather than the internecine struggles of the Caucausus.

Thankfully, the countries that have seen the really big values shifts are also mostly committed to delivering open source innovation, so we ensure that to the greatest extent possible we're able to share out all the improvements to existing technology. And people really only need to earn enough exchange credits to meet their needs.

The role of business

Democracy has become much more time-consuming, but there's a real recognition that it's worth it – for the time being at least. We've still got enough people around who remember the bad old days when it was actually markets that dictated what happened, and when politicians, when they bothered to connect directly with the electorate, were guided by snapshot opinion polls that tended to ask questions that simply reinforced existing values.

Today not every business is doing it, but we've realised that it's certainly not impossible to build social purpose into the heart of enterprise. Plenty of businesses have gone bust of course: the legislation on mandatory social and environmental balance sheets made it more difficult to raise capital, and now, companies can even be fined under the Prevention of Short-termism legislation if they fail to balance the long-term social and environmental costs of their activities and impacts against the short-term economic gain. And as citizens, we've all got rights to access information held by the private sector, not just information held by public agencies.

Businesses today are hubs for democratic engagement. Nobody expects businesses to vote any more, but there's a lot of wisdom that accumulates within enterprises; a lot of knowledge that comes from all those contacts with suppliers, workers, consumers, financial backers and so on. So these days elected representatives seek 'advisory opinions' from the business community before opening up deliberation to residents and voters.

The future

Well that's my world. Not too bad is it?

I am worried about quite a few things in the future though.

For a start, I'm really worried about life for people in many other parts of the world. It's all very well reducing our consumption, but we're fairly blessed here in the UK in terms of things like access to water and so on. There is so much of the world where things have only got worse over the past forty years; so many countries where democracy's faltered.

I'm really worried too about how we'll cope with the next wave of climate migrants; it's going to be tough to hold all our democratic decision-making structures together with lots of new people who won't know how we do things in our community decisions. Food rationing is on the horizon too.

Actually, my biggest worry is that we end up with somebody trying to really push change from the top. Even though we've got fairly solid shared values as a society, there's no guarantee that they'll hold for the future.

We're also a bit unstable I think because whilst we've *de facto* moved to a different kind of economy, it's not really happened through any dramatic replacement of the old capitalist model with a new one; rather, there simply *has* been less to go around; financial and natural resources are scarce though societal resources aren't so much in short supply – that's because values have shifted away from the old individualism; and we've regulated away some of the old short-termism. I'm not convinced though that we've really ended up with a society that's really able to harness the innovation potential of business. I suppose that perhaps there's not enough 'thinking big' in our businesses these days. Let's hope that we've got enough to pull through.

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Post-Authoritarian democracy

This is a scenario in which, against a background of austerity and an enforced shift to technocracy in parts of Europe, political leaders nonetheless recognise that tough measures to mitigate climate change are essential. They are prepared to lead the way even without public support and resort to climate crisis rhetoric, but significant conflict results from the authoritarianism of this period. A transition to low-carbon infrastructure is secured through state-backed investment vehicles, and a global tax on currency transactions resources further investment. As governments emerge from authoritarianism with economic recovery, a values shift also takes shape, supported by a revival of public faith in democracy. This sustains the next generation of investment in mitigation and adaptation, based on a belief in the values both of civic and technological innovation. Civil society and some charismatic political leaders emerge to provide leadership on 'simple living'. Both global and national institutions are reformed. Gradually, high carbon activities are driven underground, but a revisionist 'gas guzzlers' movement begins to build.

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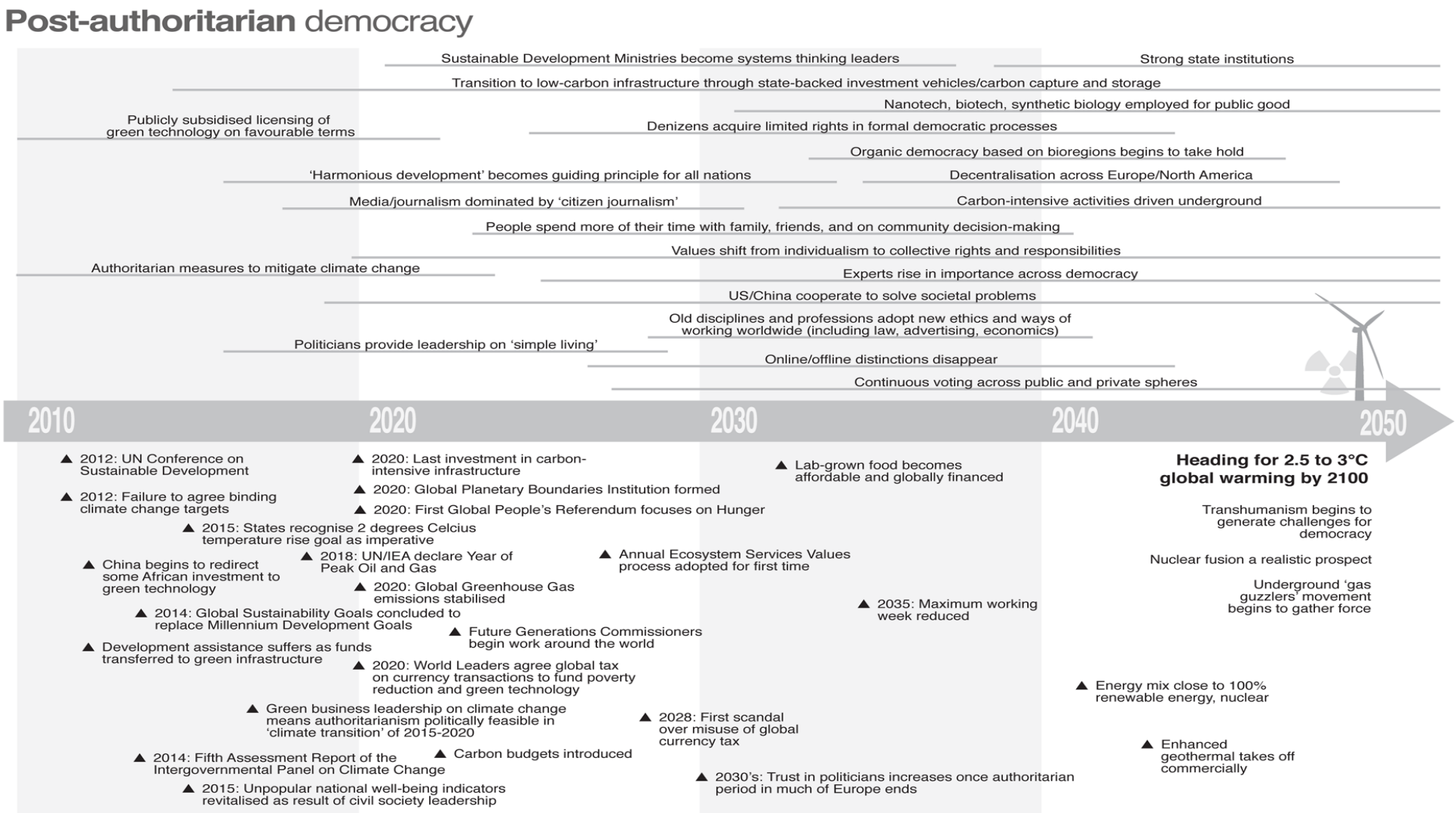
Figure 4: Post-authoritarian Democracy



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Voice 1: an enthusiast's story

Overview

I feel so lucky that it looks like we've managed to avert global climate catastrophe. The idea gave me nightmares when I was a child in the 2020s. I'd literally wake up in a sweat, wondering whether I'd survive to an old age; imagining myself having to scrabble for survival, somehow transported to the ruins of one of the great Asian megacities in one of my recurrent dreams.

The way we've averted the catastrophe is basically through a mixture of investment in environmental technology, and the amazing way that so many nations and people have managed to come together around a shared principle: ensuring that future generations don't inherit a catastrophically overheated planet. Annual greenhouse gas emissions have been declining every year since we managed to stabilise them in 2020, though we've still some way to go before we're a zero greenhouse gas emission economy. But the early years were really tough: not very democratic; lots of quite authoritarian top-down measures; and it took a while to emerge from that to the genuine shift in values that underpins where we're at today.

The difficult early years

I suppose one major headline, looking back, is that the world didn't manage to get agreement on legally binding targets in place to succeed the Kyoto Protocol under the UN Framework Convention on Climate Change in 2012. Not too long after that, after the fifth report of the now-defunct Intergovernmental Panel on Climate Change in 2014, and with some key government commitments to investment in renewable energy technology and publicly-subsidised licensing on favourable terms, that became easier.

Governments actually nearly did manage to pull together, and we really have now averted catastrophe. It wasn't easy; but by about 2015 there was a general recognition that keeping mean global temperature rise to two degrees was absolutely imperative, and that actually there was no need for massive further technological innovation to get there. With a huge push in sectors including electricity production, industry and transport, as well as buildings, forestry (where the main aim was to reduce emissions from deforestation), agriculture (where the aim was to reduce the greenhouse gas-intensity of production), and of course waste management, there really was potential to deliver the necessary changes. Add in aviation and shipping, and bingo. Well, in theory.

Gradually, businesses with that important mix of foresight and entrepreneurship started to come on board too to be really powerful allies and advocates for change. Plus, the fact that the futures of climate regulation and support for technology were becoming less uncertain themselves acted as a spur for low carbon economic development. In a way, it was the business advocacy that made the authoritarian period, itself masked by the technocratic governments that had been appointed in parts of Europe, politically feasible. That plus the fact that we were mostly numbed by the shock of the financial crises. There was a degree of 'consent' of course – but it certainly wasn't active consent, other than on the part of a few environmentalists who hankered after authoritarian rule by eco-elites. There was a fairly ruthless suppression of dissent during this time; though our rulers claimed that it was for our own good as a species, and temporary too just until we shook off the carbon-intensiveness of our economies.

The period to 2020 was tough. Hugely difficult in fact; and there were many millions of ordinary people as well as the old economic vested interests who really felt the pain. As governments adopted plans for 'green and fair economy deals', linked to pledges and the 2012 Sustainable Development Conference, many succumbed to temptation to impose change from above without securing the necessary buy-in from ordinary people. The 'greenness' came before the 'fairness' in a lot of countries.

A lot of governments in Europe and North America initially started talking about a 'war on climate change'; but that didn't really help anyone to make very much progress. It just reinforced the idea that there was a war between so-called 'sceptics' and others (and I might add that the sceptics have actually helped climate science to progress, because they've pointed to so many glitches). And anyway, the Ministries that were leading the 'war' were still subject to a lot of business as usual pressures. But there were also a couple of really charismatic leaders who emerged out of the smaller political parties of Europe and North America to make a strong case that people all had to pull together. When the 2014 Intergovernmental Panel on Climate Change report came out, they had a lot more 'ammunition' to deploy, too. With much of Europe in shock, and governed by technocrats until not long before 2020, there were plenty of people who simply weren't prepared to protest what were actually rather authoritarian 'climate transition' measures of the period from 2015-2020 when we finally put the brakes on locking in a carbon-intensive infrastructure for the rest of the century.

The model that seemed to provide greatest room for success, overall, was to offer state-backed infrastructure and sectoral investment vehicles (some of them topped up with private sector funding) to finance investment in a range of areas that really needed the additional support. Reallocation of harmful subsidies was also a really important part of the mix; including huge changes in agricultural practices which actually harmed a lot of peoples' livelihoods in the process, I'm sad to say. And carbon capture and storage projects had to be funded as an essential adjunct to any new fossil fuel project.

There were some really significant moratoria around the world on building new coal-fired power stations (at least those without state of the art carbon capture and storage facilities). Sadly, some new nuclear power stations did get built in this hectic initial period though. There was a huge shift from roads investment to investment in transport via rail and waterways. Some major investment in renewables got under way. Very sadly though, some of this shift was funded by diverting funding away from international development assistance; something which we have no cause to be proud of. After 2020 it all changed when the global tax on financial transactions was finalised.

Global Governance and comparative insights

At global level, agreement in 2014 on a really comprehensive set of Global Sustainability Goals administered by the UN Sustainable Development Programme was a real breakthrough once the Millennium Development Goals had run their course.

The UN and the International Energy Agency went into a huddle of sorts at one point and then announced, just as the Millennium Development Goals deadline of 2015 came and went, that 2018 would be the Year of Peak Oil and Gas, and that certainly concentrated political (and peoples') minds in the period to 2020.

And then in 2020 – roughly when I was born - the world's leaders agreed a global tax on financial transactions. It was among the only really obvious responses to the financial and sovereign debt crises of the early twentieth century. And it was symbolically important too in reinforcing everyone's sense that somehow it was the way we had chosen to run our economy – and the role of financial institutions within it – that was to blame for the problems we faced as a society. The proceeds of the tax are partly used to fund investment in all of the new technologies needed to maximise our chances of delivering a low-carbon economy for all; and partly the global struggle against poverty. Even some of the European countries, where inequality had increased sharply, benefitted from it. But 2028 saw the first major scandal about misuse of the funds. I wonder if we'll ever manage completely to eradicate fraud and corruption.

The first Global People's Referendum took place to coincide with the first report on the new UN Programme on Sustainable Development in 2020. 2020 was an important year in fact: there really was something in the air generated by that idea of '2020 vision'. Even though it was in some respects global economic interconnectedness that had provided the political conditions for that first referendum of 2020, it asked a simple question about global eradication of hunger. The outcome really helped to fuel a process through which lab-based food production (particularly of meat) had become affordable and globally financed by 2035. Fifteen years isn't bad really, when you consider the risks we were running if we failed to catch up with global population growth.

Later, after 2020 and just before the next report of the Intergovernmental Panel on Climate Change was due, nations were able to agree on a new Planetary Boundaries Institution, which basically worked as a guardian of a set of twelve planetary boundaries, linking the biophysical reality of environmental limits to a set of evolving social boundaries based in the idea of human wellbeing and meeting the essential needs of all humans. The really innovative thing about the new Institution was the way in which it was able to combine the expertise of scientists with 'wisdom of crowds scrutiny' of its reports. Many of the mistakes of the Intergovernmental Panel on Climate Change were avoided in that way, and the role of 'crowds' of ordinary citizen-scientists meant that it was less easy for governments or any other interest group, for that matter, to manipulate the findings. Lest this account sound too rosy though – even if we're on our way to cracking the global challenge of climate change – there's still an incredibly long way to go if we're properly to address things like the nitrogen and phosphorous cycles.

The idea of a global democracy has made great strides too in the past twenty years; not only because of the rapid spread of existing communication technology platforms, but also because nations have become more confident about democracy. With a lot of the environmental technology already developed and the finance in place to ensure roll-out, plus a really strong institutional process on planetary boundaries, elected representatives have simply become more confident.

Even in the countries that are not democracies, offering people a chance directly to shape global decisions can keep the pressure off at national level. That's cynical, I know – but it's also quite important as a way of enabling people (especially in the countries where climate change impacts have caused a roll-back of democracy) to raise their sights from everyday struggle and voice their frustrations; and to do so in ways that less democratic governments don't feel threatened by. So long as the exercise of that global democracy process is able to deliver a stream of finance from the global to the community level without too much being siphoned off along the way, it's a real help.

There's been a real flourishing of Future Generations Commissioners around the world. The 2012 UN Conference on Sustainable Development really helped to draw attention to their role. Their job is to act, effectively, as guardians for future generations. Many of them also support networks of local level guardians for future generations. Most of the Commissioners are appointed by parliaments, and most of their roles tie in with written constitutional protection for the essential needs of future generations.

In many countries around the world, the basic need to ensure that democracy and policy processes take account of future generations is now recognised explicitly in written constitutions. Most of the world's major economies now have sustainable development ministries that have become really adept at the systems thinking and architecture that's such a big feature of our contemporary society. In my country, we have an agency for democratic foresight, which provides information both publicly and to support the deliberations of a parliamentary select committee on foresight and systems planning.

Global developments in geopolitics and investment

The world overall has seen massive investment in renewable energy and in energy efficiency. China was able to get started with building a massive green technology sector immediately of course; she even reallocated some of her natural resource investment in Africa to that end, recognising that with economic growth and development overall (and the associated greenhouse gas emissions) so rapid (despite the problems in Europe and North America).

One of the most amazing things over the past few decades has been the way in which China and the US have started to cooperate; pooling their intellectual capital. I suppose that in a way, it's a case of 'if you can't beat 'em, join 'em'. But of course China was deeply invested in the US economy, and had no real interest in the US collapsing for the long-term on account of failure to adapt its economy.

Today China's still not rich, when you count wealth per head of population. There's also been some limited progress with democratisation in China. A couple of her near-neighbours which were quite authoritarian toppled when it became apparent that there was a sort of cyclical reality to trickle-down (so that giving people a little bit of a nation's wealth to keep them quiet only works up to a point – there's a generational cycle there which can jump up to bite authoritarian leaders). And there's that idea of 'harmonious development' in China too: it's one that pretty much all the world's nations have adopted, these days.

As values in the West moved away from individualism, as we emerged out of the tough period to 2020 and our leaders developed the courage to talk creatively about democracy once more, we actually started to move closer to China in a way. We started to look to China's example differently. After all, China was still growing really rapidly. And for a little while at least, it seemed that the country wasn't that unstable either. And we were constantly bombarded not just with Chinese goods and services, but also with images of these incredibly high-tech cities. There was a lot that we didn't see, of course.

We've had a lot of decentralisation in much of Europe and North America over the past two decades as governments realised that the best knowledge and skills to solve the local impacts of even really big societal problems lie at local level. That's also been underpinned by a growing realisation that

the top-down emphasis of the period to 2020 really couldn't deliver the basic societal capacity needed to *adapt* to climate change. Local community groups scaling up their activism and a 'climate activist' civil society were critically important in providing democratic legitimacy to what was in reality a rather authoritarian governance setting in many countries (even those that had previously been 'democracies' in the true sense of the word).

Today, we're on track to being close to 100% renewable energy by 2052 (albeit including some nuclear power); and beyond that, nuclear fusion beckons.

The overall prognosis, taking account all the latest evidence on climate feedbacks and so on, is for roughly two and a half to three degrees Celsius mean temperature rise before the end of the century. That's now fuelling (if you'll allow me to use the word) a lot of further technology investment. Some of it – the cutting edge large-scale geoengineering for example – is proving quite difficult to get off the ground. But enhanced geothermal has really taken off already, as have all sorts of new technologies based on solar and wave energy, as well as the older biofuel technologies (now with added 'equity dividend', as governments are keen to remind us).

Democracy at national level

Overall, politicians are much more respected in democracies these days because they're much more open about the choices that they're making, and the challenges of the trade-offs. And with parts of Europe coming through an awful period from 2011 up to about 2020 where elected representatives were replaced with unelected technocrats, we're more willing to accept the leaders that we elect as legitimate, warts and all. Climate change always features heavily in all the pre-election propaganda; but so too do some of the other planetary boundaries.

The clearout of the global finance sector, which ultimately led to democratic principles being brought into global finance regulation, has also helped to strengthen the legitimacy of elected representatives. We all also have real-time access to information about business lobbying so that we can see how the remaining 'vested interests' are behaving.

That old distinction between being 'online' and 'offline' has really disappeared, pretty much, at the national level. We vote for different things several times a day: ethical sourcing policies at our preferred suppliers; how our local representatives are doing; discussions in parliament and regional assemblies and so on. But our overall system of democracy has got so much better at joining the dots between all the different bits of feedback. It's not actually 'direct democracy'; but whilst it ensures that the business of government takes a bit longer, because it's more nuanced, it provides us with a much better aggregated input into the overall democratic process.

The struggles to combat climate change and to deliver the environmental technology we need have meant that state-centred institutions have had to remain quite strong. All the new generation of environmental and social taxes and incentives; not to mention the 'wellbeing mapping' lifestyle change tools; the ongoing processes to set and re-set the annual Ecosystems Services values, and to keep the research processes going to sustain them; all of these have meant keeping quite a lot of expertise and regulatory capacity at the centre.

There's been a fairly major shift in the policy tools that governments deploy, and that hasn't been a smooth transition either. There have been lots of risks to manage as we've moved towards an

environmental technology wellbeing society: particularly some of the new 'fusion' technologies (nanotechnology, biotechnology and synthetic biology, for example). They've generated some real tensions – though we're now much better equipped to manage them.

From the early days of struggle and conflict, over time, politicians started talking much more about *values* as well as the economy (including the green and fair economy of course) and debt. They worked hard to provide us with visions of how we could make our lives more simple (not easy in a 'risk society' with access to very sophisticated communications technologies). They still tried to work at all sorts of levels to get us to reduce the carbon-intensity of our lifestyles and so on; but there were also a few leaders who really did lead by example and somehow managed to convince more people that we could actually be happier *and* healthier if we stopped wanting *things* so much.

There have been well-being indicators at national level of course since 2013, though they weren't well-received initially until one of our most credible civil society leaders and her non-governmental organisation launched a big campaign, which resulted in development and adoption of a new set of indicators in 2015 (in the midst of the pain of that initial low-carbon transition).

Quite a lot of decisions around the world are taken these days on a bioregional governance basis (some people call it 'organic democracy' in fact); where ecosystems and political boundaries are aligned. We've not yet fully worked out how to mesh that with other political boundaries and local level decision-making. It's one of the major tasks on the global and national agendas for the global sustainable development gathering in 2052. The idea of organic democracy really originated in some of the old thinking about community based natural resource management, and gradually reached the western hemisphere from parts of the great African continent in particular.

Lowering the limit on the maximum working week was also a big breakthrough – though that had to wait until 2035 to allow those people who still had debt owing on their homes to manage the transition and to allow countries to adjust their immigration patterns to the reality of a significantly older population and all that that meant for the balance of economic activity.

Democracy at local level

Today, regional government has mushroomed; to the extent that some people are now quite unhappy with how big it's got; partly because we spend so much time in dull meetings working out how best to manage all the minor constitutional issues that arise about what level to pursuit issues at. And since sustainable development, which is now the organising principle of government, straddles all levels of government and governance, it's raised all sorts of problems; particularly when the national interest in energy efficiency and environmental protection has meant that people at community level have to countenance some downsides. India's been a real source of inspiration actually, because it's a country where they've been doing community-based resource management for such a long time. Not to mention being the world's largest democracy.

There's been endless wrangling about the detail of where to put our renewable energy infrastructure, but with really fair central planning on the renewable and carbon allocations (experts on tap; people on top, if you see what I mean) and then properly empowered communities discussing the key planning decisions in ways that everyone can engage with. It's been really important to make proper country-wide plans for which bits of infrastructure and technology get sited, or operationalised and developed, in which bits of the countryside. We've got really clear rules

of engagement now. Some people say that restricts our freedom of speech; but having been through the really tough years of the early twenty-first century, it's a price worth paying.

The spaces where we're participating in person have evolved. And now that everyone's got access to electronic communications technologies, it's become much easier to mobilise people and communicate with people inbetween meetings – and to gather ideas and input from people who aren't able to get to face to face meetings.

A lot of people are spending more time with their friends and families, or getting actively involved in decision-making at community level. At the same time, there's still some way to go. In the main, in the more diverse communities (and actually, aside from the relative handful of people who live in rural areas, many of our communities aside from the gated ones are pretty diverse these days), it's really a middle class elite who volunteer to participate in the community-base discussions, and it's often the older majority too. They know how important participation is to the quality of our democracy, and work hard to find the time (easier now that so many people only work part time). Mostly, other people are fine with this, though tensions do sometimes flare up. The problem is that so many people have a lot on their plate. We're still dealing with the legacy of all the inequality that was built up in the early twenty-first century, and younger people all have to work really hard to keep some basic public service provision in place for those people who are economically inactive.

We've had to introduce some distinctions (some people call it 'discrimination') between refugees and other rights-holders when it comes to making decisions about collective rights and responsibilities. Still, it's a staged approach, and once a refugee has a right of residency they can still have quite a lot of say through designation as a Denizen (a sort of stage-post to acquiring the full rights of a Citizen).

Civil society and media

One really important factor in the transition from the early authoritarianism to the return to democracy was the number of entrepreneurs and global philanthropists who were able to pull together (following a really key high level conference of the global philanthropy elite in 2012) to provide funding for a global civil society movement to press for change.

There were already all sorts of good things happening at local level of course, in all sorts of places around the world; a reaction against the disempowerment that many people felt given the failure of governments to take early action on climate change. Almost overnight, some of the old community-based hubs of activism and innovation came to 'global' life, and taking up a range of 'resource kits' and practical toolkits for transforming all the good energy of that local activism into demands that the international community get its act together to deliver the change that the climate activists, at least, were calling for. There was also a grassroots move to make formal pledges (at least in the world's richest nations) not to have any children.

Most of the news reporting, and most of the online reporting too is now done by citizen reporters. Professional journalism is really a diminished profession (though the basics of citizen journalism are part of all of our educations). Mind you, we've had to put up with some fairly strange developments in syntax as a result. The old online abbreviations have gradually merged with the clipped formal

style of writing in the old broadsheet newspapers, and all of us native English speakers are used to reading non-native English in the established mainstream press.

I've mentioned the importance of civil society activism in getting us to where we are today. Initially though, civil society wasn't universally helpful. That's partly because of the sheer noise of all the voices and the lack of transparency in who lay behind which civil society groups. But it was also because there were large parts of civil society that really supported efforts to get the economy back to growth so that it could sustain not only their own funding, but also all the public investment in energy efficiency and renewable energy innovation. Ironic. Some of them actually held back progress when it came to strengthening public participation and deliberative engagement and even the wider take-up of genuinely 'many to many' communication with parliamentarians and regional governments.

Transforming old 'expertise'

Inevitably, experts of all sorts are much more important than they used to be. But some of the old disciplines have really changed. We've got a much bigger emphasis now on collective rights and responsibilities, and that has really transformed the legal profession and the administration of justice: there's much less need for formal courts now, for example.

From what I gather, economics has changed dramatically too. Lots of governments around the world have now started to publish 'futures impact assessments' whenever they make proposals that call for public funding or budgets that could have implications for future generations. That covers things like infrastructure planning, pensions, education, planning, social security – as well as environmental policy itself. Cost benefit analysis on major infrastructure projects places a really high value on future generations – the net result being a low so-called 'discount rate'. And it's a similar story in many other areas where the public sector makes use of economic appraisal and analysis too.

Advertising is another example of a discipline (and that's how we view it today; though I know it wasn't always the case) that's changed really dramatically. It's been a long hard slog, but today, advertising speaks much more to our intrinsic values as human beings – and it's much more regulated; all part of the idea that information should serve citizenship rather than consumption. Still, we do value what the economy's been able to achieve. Somehow, all those creative people working in the advertising sector have managed to achieve all of this without falling back onto really old-fashioned socialist-style advertising approaches. And anyway, these days, the emphasis is really on services rather than goods that are so natural resource intensive. There's a lot more sharing out the services at community level too. We've found space for community laundries, and docking stations, as well as all the other sorts of activities like growing food and so on that are shared. There's so much more diversity in contemporary advertising, too; because whilst our economy is still relatively integrated around the world, advertisers are getting so much better at speaking to the real core of local values wherever they're found.

The future

We've achieved a huge amount in the past forty years. But we've got some really big challenges coming up too. With people living longer and longer thanks to nanotechnology and some of the more recent technological developments, we're going to have to decide how to make decisions about *who* gets to live longest. I think most people now recognise that it shouldn't just be down to money.

Transhumanism isn't too far away now, and it's a reality that we're going to have to deal with as a matter of urgency in terms of our system of democracy. We're going to have to have a really serious debate before long about which people and beings count as 'people' for the purpose of deciding who gets to vote. Simultaneous, permanent democracy does away with part of that debate, of course, since simply existing as a sentient being is what counts for so many of the electronic permanent communication and institutionalised crowd wisdom platforms. But we still have elected representatives, and we're going to have to draw a line somewhere about who they are allowed to be: how much engineering, if you like, before you get shifted into one of the other 'interest group colleges' that are consulted on all key decisions.

Then we'll have to do a lot more on some of the other major environmental limits where there are still real challenges. Actually, it's pretty much all of them, save for those that are addressed in part as a result of our efforts to combat climate change. There's a long hard road ahead still for a world of ten billion by the end of the century.

Voice 2: a critic's story

I'm completely sick of the eco-fascists who seem to think they can dictate everything now. There's absolutely no respect for the rights of ordinary people. First of all I had to give up my car when petrol and parking prices just got too much for any ordinary person to deal with. There are hardly any two-car families any more, and it's really hard for old people now too (and there are a lot of them) not being able to be properly mobile. There's a mess on our streets because they've still not got rid of all those old humps and bumps and the like, even though they were outlawed in a very minor concession to drivers back in 2020. And that's not the only thing that's a blot on the landscape. There's windmills (for the homespun ecoveggies) and turbines and dams and ugly solar reflective film everywhere. There are even some of the old solar panels still around – some of them in vast quantities spreading across the world's deserts. Some hair shirt so-called 'intermediate technology' idiots started painting roofs white across the country and now we've got loads of peeling paint everywhere.

I could get a hydrogen fuel-cell vehicle of my own, but it's too expensive, and I've got better things to do than spend my time queuing up at all those so-called 'smart' docking stations for electric vehicles. So like most other people, I'm forced to use the grubby hired vehicles that mess up the streetscape. There are rules now for when you're allowed to travel by personal vehicle, and electronic tagging means you get automated fines if you don't stick to the rules. Everyone has to have a mandate set up to allow the state to collect penalties and taxes for carbon this and eco that on an ongoing basis and with only five days' notice too.

I've nearly lost count of the number of times I've been out of work. I'm an engineer, and I used to work on car assembly lines in the old days. But they wanted a new breed of people for the latest generation of personal transport and I didn't have the right qualifications they said. I became a traffic warden next – but that just got too acrimonious, and I refused to take bribes anyway which made it difficult. Then I worked in a petrol station; but that ended up being the front line too once rationing was brought in. Now my daughter supports me – she's got a good job and lives in the same block as me.

We've still got some planes – but they're mostly limited to military use since shale gas is so scarce. The solar-powered planes aren't really onstream yet, so we're all pretty limited in how we experience other countries. I'm totally sick of constantly having poor people from Africa thrust into my thoughts by all the propaganda that's out there. My family comes first, not some skinny big-eyed kid in a totally different continent. They should be sorting out their own problems not coming running to us. Things are bad enough as it is here with all the climate and water refugees the government's forced us to take in and the overcrowded cities. You hardly ever hear English spoken on the streets of London these days.

Then there's climate change. It's a massive scam. Completely bonkers. There's never been any problem with our climate. We've always had droughts and storms and occasional floods. Crops have always failed. There have always been famines. It's got nothing to do with so-called 'greenhouse gas emissions' – years of online citizen research have proved that beyond doubt, to my mind. It's a massive conspiracy, and I have my suspicions as to who might be behind it too.

I belong to a secret gas guzzlers club. They've sprung up all over the place. Illicit of course; but it's a real peoples' movement in the old way. We share all our ideas and have a code of honour. The basic idea is to recreate the good old days before the authorities started to tell us that fossil fuels were scarce. I blame the greedy Russians and the greedy energy companies for that. They seem to dictate everything, and people just sit and take it. We smoke cigars and cigarettes (they're illegal now too) and take retro drugs which one of the guys brings in from Afghanistan whenever he's back from a tour of duty advising the so-called government there. A few of the members have got vintage motorbikes that we race with pilfered petrol whenever we can find a suitable venue where we'll not be caught. And some people are also starting to brew much more radical ideas. We can play the ecoterrorists at their own game.

We've got to stop the climate change madness. It's completely ruined the prospects for a whole generation. How can that be good for the future?

We've got justice on our side.

Technocratic democracy

This is a world in which eco-technocrat elites and their business backers dominate politics and the practice of democracy, and there is a huge emphasis on technological fixes to climate change. The fixes include geoengineering, partly financed through military budgets. There is no going back on this huge experiment with the earth's systems: no-one can be sure what would happen if geoengineering were halted; and its impacts are hard to prove, despite massive investment. Voter participation in democracies is at an all-time low, though formulaic opportunities for direct 'customer feedback style' engagement abound. Economic and social crises dominate every day politics. Experiments in sustainable living have failed to gain ground in the world's affluent countries. Meanwhile, a powerful Global Environmental Innovation Panel under ISO and the World Trade and Investment Organization issues technology investment recommendations which are binding on governments. Mean global temperature rise is at two degrees Celsius over pre-industrial levels. The prospects are for anywhere from 3-6 degrees Celsius mean temperature rise by 2100, depending on the effects of geoengineering.

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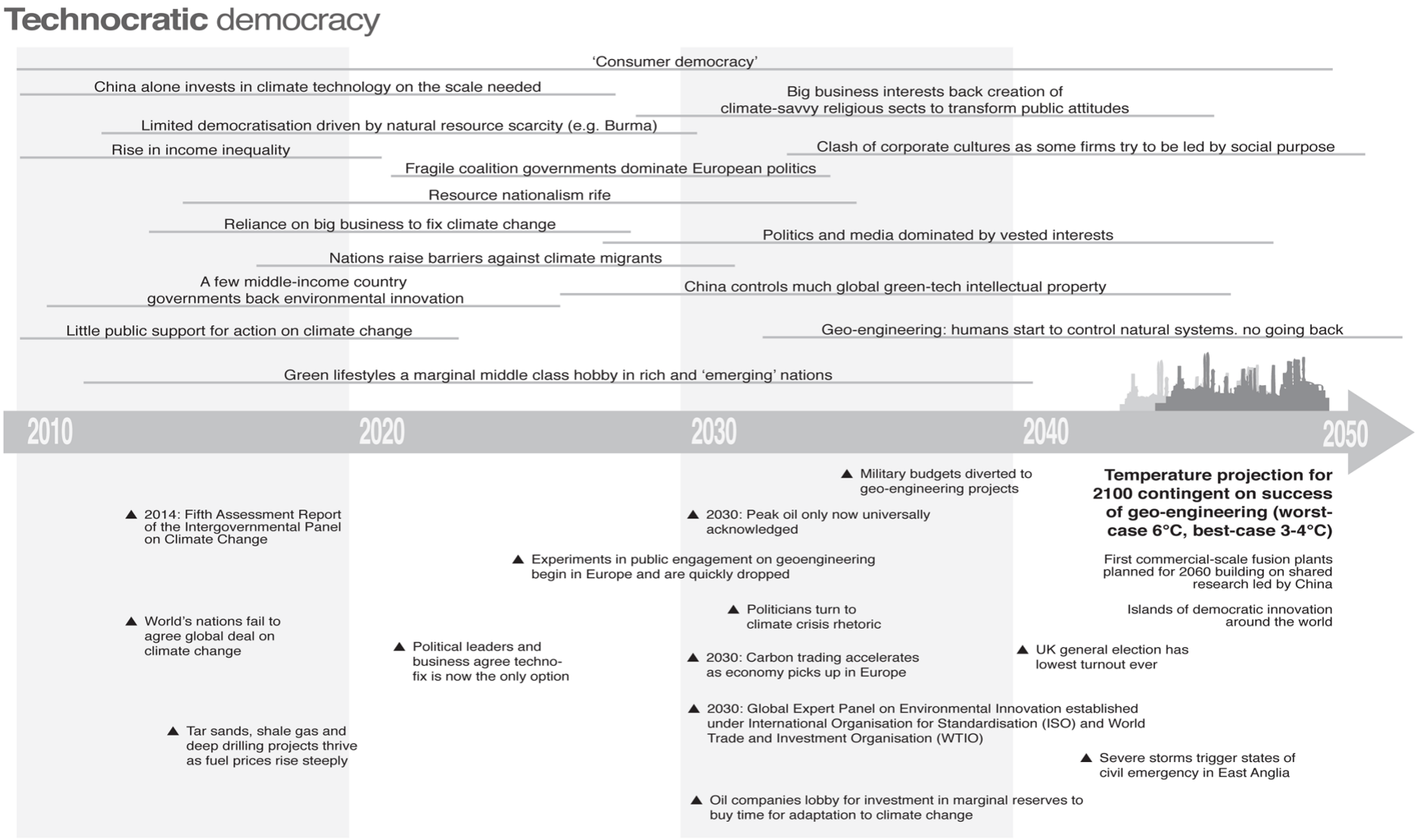
Figure 5: Technocratic Democracy



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Dmitry's Story

Overview

When I look back over my international career, now that I'm coming up to seventy, I'm thankful that the world has got this far. Or rather, that we humans have got this far.

We've kept mean global temperature rise to two degrees. But it's not looking good for the generation to come, and temperatures are certainly set to rise further. If geoengineering fails, we're looking at up to six degrees centigrade over pre-industrial levels by the end of the century. We've *de facto* had to rely heavily on technology to deliver solutions to climate change, simply because we didn't really grasp the nettle in the first two and a half decades of the twenty-first century.

Without real public support for major transformation of economies around the world, save for things like tightening up of emissions trading regimes and rules on mandatory carbon capture and storage, governments mostly invested (late at that) in 'big business' technology fixes to climate change.

So much of the intellectual property for the green technologies of the future is now in China, and it's vigorously enforced. That makes the fragile economies of Europe and North America even more vulnerable to climate change.

Relatively speaking, we never really made any big changes to high consumption-based lifestyles around the world, so we're enormously vulnerable, societally I mean, to twists and turns in the economy as the main determinant of overall climate outcomes. I suppose what I really mean to say is that not that much has changed over the past forty years or so.

Climate impacts

Already, many of the world's smaller islands have suffered major damage to their infrastructure as sea levels have risen; and that's before you even begin to take account of the impact of seasonal flooding. The lower islands have lost as much as a fifth of their GDP (if you'll forgive the old metric) as a result of the changes in weather systems and the new patterns of storms and floods. India and China's agricultural production has taken a really big hit too – with China losing 10% of its rice crop yield potential since the start of the century, and India suffering around 5% of its wheat and maize production potential. Across the world, we're seeing many more people suffering the effects of increased water stress. It's hitting the world's poorest people the worst, of course.

With the world's population at close to 9 billion now, we've come through several crunches and waves of crises as a result of migration too. Let me put it this way: there are a number of extraordinarily long and high physical barriers in place in some parts of the world to keep out migrants; people seeking new lives far from their failed crops or storm-devastated homes. There will be more to come.

You might think that it would be better in Europe or North America – but even there, and even though crop yields have gone up in North America and Northern Europe; there are real problems in Southern Europe, where water availability has dropped by around a quarter compared to the start of

the century and wheat yields have gone down too. The weather is much less, well, predictable in Northern Europe too.

I've lost count of the crises from massive forest fires – a particular problem in my home country, Russia, but also Australasia and some of the other northern European countries too. In Australia and New Zealand, we're seeing 5000 more heat-related deaths each year; and every year, people who can't afford to heat themselves during cold winter months are suffering more as the price of fuels continues to rocket. Some lucky people have access to some excellent high tech solutions of course – but we're really feeling the impact of all those greenhouse gas emissions that we put into the earth's atmosphere at the start of the century – and before.

We're also learning the hard way about all the ways in which the different impacts of climate change relate to one another. Mental health problems have increased, and growing inequality pretty much everywhere has made it even more difficult to get results from investing in building peoples' adaptive capacity at community level.

Resource nationalism

The seeds of what has gone before were, from my perspective, really laid down in the 1970s, with its oil shocks and its wave of resource nationalism. Perhaps I would say that, given my background in global energy governance. But in 1973, Saudi Arabia's embargo on exports of oil to the West in retaliation for Western support for the Yom Kippur war had meant that oil prices quadrupled; triggering inflation and major food supply problems in European countries. The 1970s saw the first of a series of oil shocks and nationalisations of previously private enterprises in sectors that the governments of many newly independent developing countries considered strategically important. And it certainly meant that social democracy in Europe was thrown off course for a while.

In contrast the 2030s, driven by the reality of peak oil and gas (and emerging evidence of peak coal, to boot) weren't characterized by quite the same sort of resource nationalism as the 1970s; but there were certainly some common features in terms of the policy tools that were applied: nationalization; expropriation; export controls and the like. And whilst in a few countries resource nationalism was genuinely ideologically driven (particularly in those resource-rich countries that had only recently emerged from authoritarian rule) in others – my own among them – it was just about the raw power politics of energy security.

At one stage, we even saw oil companies trying to convince us that one of the best ways to build a basis for adapting to climate change was to back them with public investment in more and more marginal oil and gas reservoirs.

But I'm digressing.

Russia, the US, India and China

I was born in St Petersburg (Leningrad as it then was) in the last decade of the Soviet Union. My father was a doctor and my mother was an engineer. I remember that as a child we enjoyed all that that great city had to offer: the ballet and the circus; the formal parks; strolls along the canals -

lingering at the gorgeous bridges. And there were the White Nights of summer - those long evenings when the sun lent its energy to fuel our dreams.

In the dark days of the late 1990s, when the ruble had collapsed, and we feared for our futures and wondered how we would ever get through our city's cold winters; I entered military service. I am very glad that owing to some favours that were due my parents, I was spared being posted to Chechnya to fight.

We were all thankful, too, for President Putin in the days of his first Presidency. He helped us to revive our belief in Mother Russia; and our newly invigorated sense of national pride helped us to cope with the reality of the never-ending struggle of alcoholism; the vice in which it held our dying rural communities. Vodka and nationalism helped us to survive; and of the two our rampant nationalism was, I would say, the more comforting in ordinary day to day urban life.

Russia had never been a democracy in any meaningful sense of the word, but I do remember looking at many of the world's democracies as I grew older and thinking that there was really no need for us to go that way. I've changed my mind now. But then, after all, we had plentiful natural resources to keep *us* going (if few to ensure that ordinary people could pay their bills). At any rate, with a few minor military skirmishes we managed to retain almost complete control of the oil and gas resources that we held in our vast territories. We even found ways to increase them as Arctic sea ice receded for more and more of each year, and we're pretty close now to year-round Arctic navigation, giving Russia control of huge new reserves.

The United States wasn't that badly off initially in terms of energy security; for whilst their political system and their constitutional settlement meant they did almost nothing to tackle climate change, they at least had coal to fall back on if all those risky investments in tar sands and other marginal fossil fuel reserves failed. And of course they didn't fail, in a sense: as oil prices went through the roof, all those marginal reserves; the deep sea ones; the ones in fragile environments, became more and more commercially viable.

The pursuit of democracy is almost never used now in justification of armed conflict. The US really *was* hooked on oil, as the lingering wars in North Africa and the Middle East attested.

Everyone could see that the old fossil fuel-based economy would end before long. And the US oil companies – along with the ones they aspired to influence, like BP before it went under - couldn't really keep up anyway with the state-owned (or controlled) enterprises that, well, let's say the less liberal nations – like China and Saudi Arabia – were able to muster.

Global governance

The world failed to develop any meaningful set of global commitments when the Kyoto Protocol expired in 2012. A wrangle about finance; all the usual stuff of self-interested states who'd not yet learned the diplomacy of a Peak World that somehow didn't really materialize in quite the way we imagined it. In a way, the old fossil fuel lobbies were too powerful to allow it to do so at first, so that peak oil was only universally acknowledged around 2030. But the intergovernmental negotiating machinery of the global climate convention, whilst scaled back, stayed in place. The global interest in

finding ways to stimulate a new wave of environmental technology innovation to kick-start a new economic growth cycle ensured that; as did genuine concern for finding ways to replace our dependence on fossil fuels.

The old Intergovernmental Panel on Climate Change issued its landmark Fifth Assessment Report in 2014. There was the usual clutch of stupid mistakes, and as before it didn't really speak to ordinary people, but the overall message was really clear to policy-makers: the mean temperature increases were likely to be in the higher ranges, and the irreversible tipping points were much closer than we'd thought.

Early investment

In the early days, the main new entrants in government renewable energy investment and innovation for low-carbon economies were the more market-oriented middle income economies; still suffering major inequality, but looking for ways to leapfrog their economies ahead of the mess that they saw lay ahead. Chile was one example.

Politicians, at least, were convinced of the risks of climate change by about 2015, but it took another ten or fifteen years, until the early 2030s, for them to feel able *en masse* to override the self-interested clamour of their electorates (many of them much poorer than they had been in the early twenty-first century). When they did so, they turned to climate crisis rhetoric. They had no choice, for nothing else could convince the public that the pain of increased fuel prices; high cost food and job losses that they were feeling as a result of population growth and peak oil and gas (and a plateau in coal) merited the massive re-direction of resources that was now proposed in Europe and North America. Barely had they recovered (in the West, I mean) from the shocks of the second decade of the twenty-first century than more pain was promised. Long-termism in politics, at this point, was largely sustained across successive parliamentary terms by the reality that multiple crises would be delivering fragile coalition governments for a long time to come.

Markets alone couldn't really sustain investment in low-carbon businesses on a scale needed to deliver what the climate scientists were saying was needed; though they certainly saw the potential. Whilst analysts accepted that we'd reached the end of that initial wave of ICT-related technological innovation, it proved enormously difficult to find the public resources that we needed to invest in securing the benefits of a new wave of green technology in those climate-critical three decades to 2130. With a few exceptions, such investments as were made had to be rationed very substantially.
Of course, some particularly charismatic and popular political leaders in the West were happy to show leadership earlier than 2030, even in the face of lukewarm direct public support – Germany was one example, though even there the support for green technology wasn't on the hoped-for scale, given the knock-on effects of Europe's sovereign debt crisis.

Such 'early mover' countries could also point, in their support, to a small 'future generations' movement, working to bring the needs of future generations into the heart of policy. Parts of business got it much earlier too, and started to speak out more forcefully about the business benefits of investments in green technology, and the transition to a low-carbon economy. But the idea of a 'green economy' – in terms of any really fundamental restructuring of the global economy - never really got beyond a few symbolic attempts to support greener innovation.

In the five years from 2015, the year by which the International Energy Agency had warned that the sunk costs of energy infrastructure would make it impossible for the world to change course unless we made a really rapid transition in the five years up to then, we really struggled to make any of the changes needed. In Europe there simply wasn't the cash to invest on the right sort of scale in renewables, and plenty of new nuclear power stations were built too. It wasn't that there was *no* investment in renewables, but it was tokenistic. At the same time, aside from the effects of recession, the underlying aspirations that fuelled the lifestyles of the affluent world didn't really change either very significantly.

In the thirty years before the shift to geoengineering – roughly 2030 - China was really the only nation with the money needed to make the public investment on the *scale* that was needed. More and more ordinary people were looking enviously towards China. And in reality, they did so without having too much of a clue about what they were hankering after. Even today, there's a world of difference between the glitz of Beijing and the basic quality of life experienced by people in China's rural areas.

Another thing I'm sad about is that it proved impossible in so many Western European countries to maintain public subsidies for renewable energy at the household level until about 2030. They were simply too visible, and therefore too vulnerable when it came to elections given that public support for action to tackle climate change was fickle. Some of the public support measures *could* be sustained though: all those insulation and energy efficiency schemes in Northern Europe and North America for example kept going because they could show governments' commitment to tackling fuel poverty, and part of the costs could be passed on to the market (i.e. consumers) anyway. Rules for new buildings tightened up pretty much everywhere; and with people increasingly living cheek by jowl in concentrated urban areas and rather few people now living in rural areas, there was and still is plenty of scope to go to scale when it comes to making further improvements in energy efficiency.

Mind you, at least carbon trading really took off once more around 2030, when there was finally a bit of an upturn in European markets and the price of carbon went up really significantly. The European Union had managed to make some changes to its emissions trading system around the time of the release of the IPCC's Fifth Assessment Report. Carbon trading systems started to be supported by removal of trading permits in times of economic recovery. In the new 'post information technology' age, it was generally recognized that a high carbon price could actually help get us *out* of recession by stimulating more green investment.

Geoengineering and technofix solutions

By the early 2020s there was enough scientific evidence on climate change even for groups within the pro fossil fuel lobbies to start to argue for a radical change in direction, seizing the business opportunities of a global techno-fix for a faulty climate system whilst squeezing the last dollars and yen out of the resources that remained.

Geoengineering was the new oil, but we'd not started early enough on the path to technological innovation for climate adaptation and mitigation. When the shift to investment in mitigation through geoengineering came, the business leaders who had been pressing for tougher action on

climate change for years were furious. More than ever before, the tensions between different business models and different approaches to business 'sustainability' played out through bitter boardroom battles that often spilled out into the public; a sort of clash of corporate cultures; the genuine enlightened self-interest of businesses serving environmental and social sustainability versus the rent-seeking 'enlightened' self-interest of the dinosaur old industries.

So it's really geoengineering where we're seeing the current energy (if I can put it that way). We've seen lots of experiments with geoengineering – particularly over the past fifteen years or so, once the big industry lobbies really started to back techno-fixes. They've not been uncontroversial, to say the least. And they've also been pretty piecemeal - partly because they don't carry very strong public support.

A few of the more progressive European governments tried out some fancy internet-based public engagement techniques to do deeper engagement than simply posting questionnaires or unfathomable consultation papers via peoples' communicators; but the poorer countries didn't. And those more deliberative experiments had to stop anyway, because as soon as people really started to engage properly about the risks involved with geoengineering, they came out against it. But frankly, most people who didn't get involved in that way were fairly disinterested and really wished that the politicians would get on with making the difficult decisions for them – and do so without too much sleaze or jobs for the boys.

Political elites can't afford the risk of calling a halt to geoengineering today, because they can see no way aside from technological innovation (or mass extinction or complete collapse of the global economy) to mitigate climate change.

At any rate, we can't stop the geoengineering. We've found it extraordinarily difficult to make robust claims (let alone substantiate them!) for what impact the trials have had – or might have. They're expensive, but now that we've started it could actually be dangerous – to the earth's climate system I mean – for us to stop. We simply don't know what might happen to some of the key tipping points if we were to do so. We could trigger runaway climate change as a result of our attempts to mitigate it.

There's some anticipatory climate research still going on; but what's much more significant is the drive to create the right enabling environment for environmental technology innovation. As ever, it's the world's poorer people (and there are a lot more of them now, overall) who will really suffer as a result. When the priority is planetary survival, even health and education investment falls by the wayside.

On democracy and democratisation

I haven't said so much just yet about democracy of course.

Funnily enough, around the world democracy did spread a little, initially at least. The advances were in that period before the old OECD nations simply lost the financial resources that they needed to wage non-critical wars or absorb the consequences for *them* of economic sanctions on resource-rich nations. There was this fear that it might be difficult to get natural resources out of, well, let's say,

charismatic authoritarian regimes – I'm thinking of places like Burma now – if established democracies insisted on maintaining economic sanctions. So in some places with an interest in receiving foreign investment, there were external pressures in place that drove a certain amount of relaxation.

In other places like some of the Central Asian countries, there weren't really the incentives or the investors in place to bring those pressures to bear. Most of the established democracies were just desperately keen to retain their businesses' access to fossil fuel resources and uranium; buying time through all sorts of underhand deals whilst they frantically worked out how the hell they might be able to deliver a transition to non fossil fuel-based energy.

Of course, even in those countries that held natural resources and were quite repressive, ordinary people did take to the streets from time to time. Mostly, their protests were bloodily suppressed. Some of the more authoritarian regimes even *encouraged* some forms of public participation; demonstrations and critical writings; boycotts even; so long as they were kept directed at foreign enterprises or unpopular business owners rather than political elites in government. And with technocrats and experts in the ascendancy even in democracies, there wasn't much countervailing pressure in terms of foreign policy or diplomacy to be honest.

There were a couple of exceptions to this general stagnation of governance in resource-rich countries in those countries whose resources had run out rather quickly. They witnessed deeper revolutions and for a time, greater opportunities for public participation in the immediate aftermath. There were a few street executions of former rulers in such countries – but it takes time to really shake up the old flows of money. With natural resources that had sustained those rulers (and allowed them to trickle down just enough of the wealth to stay in power) depleted; the only sources of funding to sustain deeper regime change came from diaspora businesses and communities. Military elites took over in some of them. Others descended into civil war.

The world's largest democracy – India – has so much on her plate in terms of managing climate refugees and the sheer scale of poverty and social injustice (plus increasing inequality) that her foreign policy goals, too, tend to be rather old-fashioned. Without the military muscle of China or the US, she's not in a position to act as a global policeman. There's not much support within the country for tough measures to mitigate climate change; both the growing middle classes and the mass of poorer people see to that.

At the same time, India is in many ways one of the great hopes if democracy is to survive what I'm sure is a worsening climate crisis to come; and she's also one of the major sources of investment in the new green technologies. With her huge population, and middle classes still outnumbered by the weight of (voting) poor people who have really understood that they have a say; there's a much greater potential to get majority support for investment in climate *adaptation* across the country.

Mitigation is another matter. It might take a new alliance between India and China – or at least public support for G2 or G3 leadership, if you like – before India's leaders can persuade their skeptical electorate of the benefits of mitigation measures, going forward. That's not completely off the cards, despite the centuries-old animosity. After all, both countries stand to gain from ensuring

that it's their economies that roll out the green low-carbon technologies of the coming decades. There could even be, if not net benefits, then at least no net disbenefits, because their businesses now control so much of the intellectual property, with India supplying most of the world's smart energy information technology systems, to give but one example. And there's perhaps, if I may say so, a deeper culture of long-termism in both countries than in the democracies of Europe and North America.

In Europe and North America, as I've already mentioned, old-fashioned corporate lobbies still dominate politics and supply much of the funding for political parties. Political elites have largely worked on the basis of an assumption that it's markets and mainstream business models for resource allocation, investment and innovation that are superior to anything the state and civil society can supply. The odd legislative proposal for reform of business organizations has found its way onto parliamentary agendas from time to time, but not much has really changed over the past two hundred years or so. We're still peculiarly committed in principle to the idea of global economic integration, though the protectionist exceptions to the principle abound.

Funnily enough, despite the maturity of a really wide range of electronic communications, commercialised mass media still dominates public debate – they've just penetrated all the new modes of communication much more deeply than the proponents of 'open source' this-and-that could ever have foreseen.

The old political parties have largely stayed intact and work *as* parties mostly by projecting marketing messages across the mainstream media; but they've been joined by far more vociferous fringe parties on the Right, who've sought to respond to peoples' sense of injustice about immigration and the rising costs of fuel, shelter and food. These new parties have fragmented the votes of the mainstream centre-right parties and given rise to some fragile coalition governments across Europe. A few countries have left the EU. Turkey decided not to join, in the end. Not surprising really given the parlous state of EU politics by 2015 or so.

Mostly, citizens and voters are viewed as significant by elected representatives for their role as consumers, not as really active citizens. It's a 'consumer democracy' really. There's been a lot of decentralization, mostly driven by a hatred on the political Right of big government. But that, linked to all sorts of new opportunities to offer feedback on 'customer experience' or 'service delivery', hasn't really offered very rich opportunities for democratic engagement. There's just as much skepticism about local politics as national and regional politics now. There are always low voter turn-outs at local *and* national levels in any 'democracy' you might care to mention.

The old religions haven't really stepped up to the plate to fill the gap or offer antidotes to (enlightened or unenlightened) self-interest either; there's too much remaining culture of individualism for that. And despite the physical spaces that they provide for much decentralized decision-making, congregations and so on have dropped in numbers. Mind you, at one point some of the big business interests that had really 'got' climate change and despaired of the voting public started to put huge investments into creating a range of climate-savvy sects in some of the world's major religions. All disguised, of course – and there was a minor scandal when it was revealed, though no-one was in the least surprised.

In many European countries, what amount to commercial eco-technocracies have really gained ground in the last two decades. The idea of building a genuinely 'green economy' didn't really take off in the first three decades of the century as I mentioned already; there just wasn't enough public support for the sort of transformation that was required; that point of inflection that the financial and sovereign debt crises offered was, frankly, squandered. But the scientific evidence on climate change was getting clearer and clearer.

Most governments now are relying on experts to make really difficult decisions about environmental innovation. An influential Global Environmental Innovation expert panel was set up in 2035 under the auspices of the International Organisation for Standardisation and the World Trade and Investment Organization. Governments were quite happy to agree to changes to global trade and investment rules to the effect that its recommendations are binding on them when they were make choices about taxes or other sorts of economic instruments (subsidies included) that have an impact on their economies' carbon-intensity. I really can't stress enough how significant this body is.

How do we live then; those of us who live in Western Europe or North America? Well, we certainly didn't see anything like a mass movement towards sustainable living patterns; at least not one that went beyond seizing the benefit of such incentives as existed. And there were limits to what people could achieve as consumers: for a start, it was access to dollars or yen which determined how much impact they could have. A sort of 'one dollar one vote' system applied at the checkout.

Community-based sustainable living initiatives have gained ground though – some of them building on the old Transition Towns movement. Some of them, even so, spread to parts of what used to be called the global South (Brazil and India especially). But they've largely stayed the preserve of the middle-classes; many of them newly poor (relatively speaking, I mean) as a result of all the cutbacks in the 2010's and 2020's; and they largely remained as a hobby rather than a real vocation. They never really gained enough ground to 'tip' political culture. And for all that local community groups engaged with their local elected representatives (most of whom had very little power in the face of the local budgeting officials); these sorts of experiments in community-based sustainable living didn't really enter the formal political system. They certainly didn't gain enough lobbying power or find ways of joining forces across communities to come anywhere near that of mainstream corporate interests.

I suppose that overall it's really been economic and social crises that have dominated ordinary day to day politics, rather than any sort of 'short sharp shock' from any single climate change-related event. What we've seen amounts to a long, drawnout – boring even – culture war; a sort of war of values; conducted largely by electronic means. There's certainly not been any major crisis point that could serve to galvanise action. Most people exist in a state of low-level anxiety about climate change, with periodic but short-lived spikes in concern when there are major disasters in the global South or peculiar weather or devastating storms in the West.

At the same time, with global mean temperatures at two degrees and sea level rise worse than anticipated initially, owing principally to the rapid melting of the Greenland and Antarctic ice sheets; there are plenty of coastal areas in Europe that have suffered really severe flooding.

I mention the UK in particular, since I did my PhD at the London School of Economics all those years ago and have a particular fondness for it. Some of the storms there have been severe enough to lead to temporary civil states of emergency; forced evacuation of people from their homes; troops wading through the waterways that used to be streets. There's a lawlessness in the badlands of coastal Essex and parts of Suffolk that nags at everyone in the South-East and East of England and erupts from time to time.

The future

So for the immediate future, the world's nations are desperately looking for guaranteed techno-fixes to climate change. A four and a half degree mean increase in global temperatures by 2100 (on pre-industrial levels) seems very far from out of the question – more than that if the geoengineering doesn't work. Democracy around the world has suffered as governments seek to lean on eco-technocrats to cut back on investment in education and health and invest instead in technology for climate mitigation and adaptation. There are still havens of democratic innovation at the local level around the world though of course: islands of engagement and collaborative working for climate adaptation that could burst forth to allow democracy to blossom once more.

We're also now only about ten years away from commissioning the world's first viable nuclear fusion power stations. They'll be in China, though Germany and Turkey are only a few years behind. In the case of Germany, whose economy has slowed over the past decades, that's really down to enlightened leadership. We were all fortunate – the revised global Bretton Woods institutions particularly - that China was willing to increase its contribution to the big shared research projects once funding from the European Union dried up following all the sovereign debt and financial crises of a couple of decades ago.

Me? I've been offered a place on that Global Environmental Innovation Panel I mentioned. It was Russia's turn to make a nomination, and I've certainly kept my nose clean during my career as an international energy bureaucrat. I'm going to accept the position.

So long as my health holds out (and there's no reason why it shouldn't since I'll have access to all the latest healthcare advances given my position) I'm going to use the Panel as a platform to try to reinvigorate the old promise of global democracy working for all of the world's peoples. We're going to need it.

I really do believe that people can provide the answers – if only we could unleash the real power of that creative potential. Environmental innovation has to be about much more than technology. I've realized that, and I'm going to make it my business to ensure that as many other people as possible do too.

What happens next? Sketches for 2100

Whatever else, by 2100, the prospects for energy supply relying principally on fossil fuels are extremely limited. The challenge of 'peak oil and gas' will have come and gone, though what will come to replace will likely be different in each of the scenarios.

2050-2100 is a further period of fifty years, or two generations. In our heavily 'values-dependent' futures, much will depend on how the knowledge and memories associated with the dominant values set of 2050 are preserved and communicated for the future, and whether they survive two further generational cycles.

Taking the starting points offered by our narrators in 2050 and the places that they inhabit (rather than a global perspective), this section sketches out some of the possibilities as time moves towards 2100. The sketches show that the relationship between democracy and climate change is far from static. The goal of equipping democracy to mitigate and adapt to climate change is not a one-time endeavour but a continuous process. And whatever world one happens to find oneself in; and at whatever point in time; it is an endeavour that has some value.

Rationed democracy: this scenario's starting point in 2050 is grim in terms of climate impacts, social deprivation and lack of resources. But the 2050 march of the Five Million and the appointment of a Minister for Future Generations offer hope that the nations of our narrator's islands might pull together. There is clearly still some access to advanced information technology in this world, and we might assume that some solar and some other forms of renewable power are available.

Can the government of what has become a collection of islands hold its people together? And what hope is there in a protectionist, nationalist, world for preventing the outbreak of further wars, or stemming the tide of migration to an already-overcrowded group of islands?

It seems that only really strong leadership that is closely connected to grassroots demand will hold people together. That is an unusual form of democracy that is most readily associated with times of war. But this is a war against no enemy other than ourselves.

There will be a huge temptation to turn the clock back and forget about the march of the Five Million, as the period to 2100 will see additional deprivation; more rationing and undoubtedly further violence and conflict. So what would have to happen for the shift in values and its political responses to stick? The pressure on the Ministry for Future Generations and national level leadership is huge given the lack of established institutional means of connecting competing policy choices in a world where localism is relatively unsophisticated but dominant, alongside the toughest sort of command and control, rationing-based, governance.

This world demands a mix of strong leadership and the political legitimacy necessary to sustain changes in the form of local decision-making without resorting to force. The nation's leader and his or her Minister for Future Generations will be under intense pressure to deliver change, because the starting point is a constitutional and political settlement that fails to provide for integration of multiple local decisions with national priorities.

Viewed optimistically, this scenario could lead, over a fifty year period, either to 'transition democracy'; though possibly with a much reduced population and a great deal of misery, pain and squalor along the way; or to forms of social collapse.

If the latter transpired, we might find people living in Holmgren's survivalist *Earth Steward* world: "*[a]round the larger cities… most .. new developments are in gated communities.. with trade outside the community being more difficult or dangerous. Outside the gated communities salvage, fuel harvesting and animal husbandry are the main economic activities, with trade controlled by gangs and local warlords*". And a cultural and spiritual revolution night begin as people "*begin to experience the gift of resurgent community and the simple abundance of nature to provide for basic needs*". People accept that each generation will have to face the challenges of further ongoing simplification and localization of society. There is a resurgence in leadership by women and as the material domain contracts the spiritual grows. And new growth emerges from biological and community foundations, Holmgren suggests.

Even this option is more benign than Holmgren's *Lifeboats* scenario, in which most forms of economic and social organization progressively collapse. Local wars accelerate that collapse, but failure of national power systems prevents global warfare. The global population halves in a few decades through famine and disease. New forms of oasis agriculture evolve as traditional agriculture is rendered almost impossible by chaotic seasons. *"Warrior and gang cults provide meaning"* and new religions and even languages attempt to make sense of people's lives.

One could imagine these communities raiding the ruins of old cities for the natural resources that they contain. Whether a human instinct for democratic decision-making, or rather a competing instinct for individual power and control, takes hold in these communities will likely be a question that is answered community by community, rather than in accordance with some overall societal blueprint.

Leadership at the point of values inflection in 2050 is among the most critically important determinants of the future to 2100.

Transition Democracy: The values shift in this scenario wasn't merely a reaction against authoritarian government, but a grassroots movement for change, ultimately reflected in the governance system. That ought to make it more stable, but fifty years is a long time.

Lowering the voting age to 14 may head off the risk of intergenerational conflict as the voting population gets older, but will likely not be enough, in a Northern country, to deal with all of the issues arising out of an ageing *demos*. Already some non-citizens have voting rights. And those that are economically active may need to acquire more say to maintain social stability and sufficient economic activity to care for older people, into the future.

The big question remains: can the ethos of transition provide sufficient natural or economic resources to sustain population peaks over an extended period of time, or will there be a traumatic reduction in the size of the population? Perhaps immigration will actively be encouraged in order to sustain the economy – though from the Transition Democracy starting point in 2050, far more traumatic events would likely need to occur before the return of slavery that Heinberg's *Peak Everything* suggests might emerge as a possibility for coping with the increased labour demand of

life without abundant energy. With businesses as hubs for democratic engagement this is certainly not an 'anti-business' society. Indeed, there is an emphasis on 'open source innovation' rather than the closed innovation mechanisms of protected intellectual property rights (let alone slavery).

This is perhaps the scenario in which deep economic transformation is the most realistic possibility – but with global governance more about 'networked multistakeholder governance' in this scenario than others, and no evidence of widespread protectionism; much may depend on the degree of economic interconnectedness between nations and the extent to which it is possible to coordinate moves towards economic transformation. We know, however, that the starting point already reflects some fairly deep changes, with people only needing "*to earn enough exchange credits to meet their needs"*, even though our narrator remarks that *"I'm not convinced.. that we've ended up with a society that's really able to harness the innovation potential of business*". It is entirely conceivable that business interests could become more vocal, and less reflective of internal democratic decision-making hubs, as time goes on; with business leaders emerging to demand that they be given a chance to innovate in the old way and protect the intellectual property in what emerges as a result.

There may be further conflict related to nuclear waste, which could become a flashpoint for anger over decisions of the previous generation that lasted into the future. And with public resources limited and directed towards basic education, this crowded society is highly vulnerable to diseases or pandemics spread by migration or such international travel as does exist. It is unlikely, too, to have resources for some time to cope with public sector or technology-intensive responses to major natural disasters or high-tech responses to adaptation. The shared 'far and wide' values of this society, in other words, will almost certainly face some very severe tests, and the values shift in which Transition Democracy is based must therefore acquire deep foundations very quickly if it is to survive.

One question in this scenario is whether the distinction between the 'public' and 'private' spheres might have completely collapsed by 2100. Assuming that there is still an identifiable and relatively healthy, civil society by then; and the collective values that characterise it remain dominant; there may be no distinction between public and private just as there is no easy distinction between 'online' and 'offline'. Rather, there may simply be individuals, and the groups and communities through which they engage in many diverse ways. Leadership would become far more dispersed, and society far more like a natural rather than an engineered ecosystem. It will be much more difficult for single individuals to effect dramatic change. Ironically, a loss of interest in engagement could be one result unless the process of values transformation is sufficiently deep to overcome the individual desire to see 'results' from time or ideas inputted, and to hold decision-makers collectively rather than individually accountable.

Post-authoritarian democracy: The values shift (towards 'far and wide') on which this world is based is grounded in a process in which many nations emerge from a period of authoritarian governance (itself preceded by the appointment of technocratic governments in part of Europe). Much has been achieved, with close to 100% renewable energy (including some nuclear) by the early 2050s, and as many of the world's democracies emerged out of the authoritarian period, a shift towards less individualistic and more collective values supported a transition to low-carbon lifestyles.

Our narrator points to the significant ethical challenges ahead. For example, *who* will be allowed to experience the benefits of longer life? This is also a world in which some locations at least will have to absorb the challenges of transhumanism in terms of defining the voting *demos*: those countries where on ethical or economic grounds transhumans are extremely limited in number might not invest in the resources to define how best to absorb them within the *demos*, leading to new sources of conflict and power struggle. Perhaps transhumans will seek to take over in some parts of the world. Perhaps experiments with synthetic biology or nanotechnology will go hideously wrong, generating new societal challenges that dwarf climate change.

One challenge is that raised by 'simultaneous' democracy; democracy in which there is no longer any clear distinction between 'online' and 'offline' and people 'vote' many times a day. If it becomes deeply embedded, people might be happy to make the decisions entailed by the major dilemmas that lie ahead. But equally, people may either tire of the constant engagement that is required, or simply fail to live up to their civic responsibility to consider carefully the options. If the 'wisdom of simultaneous democracy' gave rise to unconscionable decisions, there might be pressure to place far more emphasis on the role of knowledgeable experts in the overall process. And people might in any be comfortable with the idea of ceding more decision-making control to experts or combinations of people (chosen by sortition, perhaps) placed alongside experts to make decisions. Experts might save ordinary people time, whilst continuing to guarantee a degree of legitimacy.

This society is in principle a good position effectively to manage the remainder of the transition beyond 'peak oil and gas' to a future based on renewable energy, fusion and the legacy of the remaining nuclear power. It seems likely that at least in more 'techno' parts of the world, birth rates will continue to drop. And with technology shared across and between countries, the transition to genuinely 'green economies' well under way, and global governance designed for resilience, the prospects are good for a reduction in global population over the period to 2100 and therefore for pressures on natural resources to ease.

This scenario is potentially vulnerable to generational shifts though – at least if the memory of the process that gave rise to the emergence from authoritarian rule to technology-intensive democracy is not kept alive. The reliance on high tech solutions to the world's food problems in particular could quickly trigger a nostalgia for a lower-tech past, and a demand that people reconnect with nature. Whether this proves to be fashion, a reflection of deeper underlying human needs, or a more negative force, will depend on many other contextual factors. One of these might be the competing forces associated with the underground 'gas guzzler' movement. Will the gas guzzlers turn to terrorism, as our narrator hints? And how would a 'wellbeing' democracy respond? Given its roots in the injustice of the financial and the authoritarianism and violence of the first two decades of the twenty-first century, much would depend on whether it had become strong enough, at the point of crisis, to cope with a major threat to social stability.

Technocratic democracy: We leave our narrator with plans to infuse the influential Environmental Innovation Panel with recommendations on unleashing the innovation power of people through democracy. Will he succeed? He might. After all, environmental and social innovation emerges from the skills and insight of people. Perhaps already in 2050, our narrator inhabits a society that has already reached the point where machines are exhibiting real intelligence. People power, it might be retorted, is unnecessary, and the priority is survival.

Even if this were the case, the (eco)technocratic form of democracy will be unstable if Dmitry, or others like him, fail, and the focus on geoengineering and other forms of unproven technology to resolve climate change continues. The pressure on the ecotechnocrats to prove to a sceptical public that they are delivering more than just 'toys for the boys' will be enormous. And whilst assessment methods for measuring the impacts of geotechnology are likely to evolve, there is also the problem of proving that it is has been worth the investment. There is a generational issue too: finding the means to transmit effectively and continuously to at least two new generations of people. 'Guardians of shared history' and new means of explaining the past may be needed in this society more than ever, to remind people why the machines and technologies that are running the geoengineering experiments need to be kept switched on.

Meanwhile, with a global mean temperature rise of three degrees looking like a 'best case' scenario, there are also very significant climate impacts to deal with. One possibility is that geoengineering proves effective – but even then, there will still be massive societal challenges to overcome, and geoengineering cannot address or forestall all of the impacts of climate change. There will be very significant translocations of people and resource wars.

This does not look to be a society that will care very well for the most vulnerable people who will be hit the worst. It is possible that a culture of individualism will only get worse – with the 'here and now' of the dominant value set limited to close-knit communities linked through kinship or proximity. More physical barriers are likely to go up, and security will likely remain a very major concern.

Geoengineering and the other high tech solutions on which this world had staked its future might, on the other hand, have proved utterly ineffective. If that became apparent quickly, global mean temperature rise may have reached as high as six degrees by 2100. It is far from impossible, too, that one or more of the tipping points in the earth's system will have been triggered by then, leading to runaway climate change: massive releases of methane from the seabed, for example; 5m sea level rise or more. Mark Lynas's book *Six Degrees* describes this world.[347] Some scientists would argue that extinction of humankind (as well as countless other plants and animals) is a significant possibility in such a world. But equally, it is hard to imagine that somewhere, somehow, there would not be a handful of human beings who had found a way to survive. They would argue and discuss issues that concerned them. They would need to find a way to resolve their differences and make decisions. And perhaps they would find that they reached for democracy as they did so.

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Afterword

Professor Tim O'Riordan

Climate change challenges democracy. But climate change also needs democracy. Halina Ward and her colleagues have created a wonderful text to show us why this is the case; the most comprehensive assessment of this relationship ever penned.

We live in a carbon dependent world. And for the most part, we are loath to forego this somewhat cosy arrangement. Carbon dependency is promoted in part by technology which gives us many good things on the cheap: electricity, personal mobility, affordable consumer goods, cooling and warmth. It is also encouraged by governments which promise easy options to low carbon outcomes, without delivering these options. And for the most part, we do not seem to care, as the goodies continue to arrive.

We all know in our hearts that this is a copout: we are duped but we connive in the deceit. And democracy is not a system that forces us to face up to these contradictions. We want to live in a sustainable society but the political system does not reward or support the innovators and entrepreneurs who would guide us to it.

Political institutions manipulate us, as do the power brokers who shape political opinion and guide policy. The size of the climate challenge threatens to overwhelm a democratic system that biases towards the *status quo*.

Democracy shuns the long term. This is especially the case when the costs of present action fall on us, the existing voters, whereas the benefits accrue to an unknown future tribe. This tribe may be our grandchildren, but we hope (and easily forget) they will not need our largesse. The apparent sacrifice is felt all the more acutely in a time of austerity. Household incomes are falling and day to day costs are rising. Moreover today, the formerly contented European middle classes, sitting in the gap between the rich minority and the poor majority, for the first time in living memory cannot be sure their children will be better off than they are. Confronted by this austere prospect, this group - the natural allies of climate stability – become unsettled.

Halina and her colleagues seek a way forward; assessing the consequences for democracy associated with trying to create the appropriate political, social and economic conditions aimed at meeting different emissions reduction pathways.

Assessing the implications of climate change for democracy to 2050 – and beyond, to 2100 – is both a challenging exercise and a valuable one. The stories that are set out in the final section of this report represent the outcome of a joyous juggling act. The outcomes reflect almost unimaginable combinations of options. The balls in the air are incentives, regulations, communications, moral norms, social interactions, technological treasure troves, and the great unknown unknowns.

What is profound though is the scope for enlightenment. Look carefully at *Figures 3, 4* and *5*. They chart the possible consequences for democracy all over the world of three scenarios: 'transition democracy' to something akin to sustainability; 'post authoritarian democracy' to a more enlightened world in the wake of failed attempts at coercion; and a 'technocratic democracy' based on authoritative hierarchism and commissions of experts. A fourth scenario; 'rationed democracy';

takes the form of a speech delivered from the year 2050 by Minister for Future Generations Septima Tulisa. It is a warning from a society that has failed to take effective climate action in time; a society in which democracy itself is 'rationed' but in which, nonetheless, there are signs of hope. All of these scenarios are plausible. All are worked through with creative imagination.

This is a report that gives us hope and a basis for setting out our new democratic stalls. We offer Halina and her colleagues our heartfelt thanks.

Norwich, January 2012

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[70] NB: this has been considered in relation to the research carried out for the project. Relatively low levels of desk-based evidence have been associated with 'medium' and 'low' in each case. The point here is to reflect on the credibility and/or storytelling force of any narratives that might result from 'high' levels of uncertainty over uncertainty *and* 'high' (or medium) levels of uncertainty on how the driver might unfold over time in different contexts when considered in relation to democracy and climate change
[71] A concept put forward by Philip Bobbitt in his book *The Shield of Achilles: War, Peace, and the Course of History*, 2002, Knopf, New York, and explored in *Paper Three* at pages 74-75. The market state tends to "*privatize many state activities and [make] representative government more responsive to the market"*
[72] A concept put forward by Philip Blond as aiming "*to blend the benefits of welfare and the market mechanism not by favouring one or the other but by exceeding both".* See further *Paper Three*, page 76
[73] These two axes are broadly reflected in Hardin Tibbs's suggestion in a March 2011 paper in the *Journal of Futures Studies* that *sustainability* depends on two types of normative response happening at the same time: green, eco-efficient technology, and a significant shift in cultural values. See Hardin Tibbs, Changing Cultural Values and the Transition to Sustainability, *Journal of Futures Studies*, March 2011, 15(3): 13 - 32. Available online at http://www.jfs.tku.edu.tw/15-3/A02.pdf
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[75] Taking the scenarios highlighted in Natural England's *Scenarios Compendium* as the entry point
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[87] This is an assumption within the Intergovernmental Panel on Climate Change's SRES scenarios
[88] Shell *Scramble* scenario, summarised in *Box 3* below

[89] Cf Shell *Blueprints* scenario, summarised in *Box 4* below
[90] See further http://www.google.co.uk/url?sa=t&rct=j&q=%22international%20agreement%22%20%22water%20resources%20management%22%20in%20ile-balkhash%20basin&source=web&cd=1&ved=0CBsQFjAA&url=http%3A%2F%2Fwaterwiki.net%2Findex.php%2FDevelopment_of_Ili-Balkhash_Basin_Integrated_Management_Plan&ei=-MmhTrTaKses8gPHvLjaBQ&usg=AFQjCNFXQBLk_84xsCSdY2z5cBRZ71al1w. The agreement does not appear to have been ratified by the three states concerned
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