We're only human: Is that what is stopping us taking climate catastrophe seriously?

'If you read one thing during COP 26 make it Valerie Iles' paper, We're only human'
Martin Vogel, The Unknowing Project

Sir David Attenborough in February this year said this:
'There is no going back – no matter what we do now, it's too late to avoid climate change and ***the poorest, the most vulnerable, those with the least security, are now certain to suffer'.***

Let's take that in for a second rather than rush past it. Millions of people and uncountable numbers of animals and other wildlife will suffer, and many will die.

Many of us will have heard that on the News, it was at the formal launch of the runup to COP26 taking place in November. Did it provoke headlines for more than a day? This is odd isn't it? That we aren't reacting urgently and energetically to this humanitarian disaster, a disaster for us and also for the wildlife we so enjoy letting David Attenborough show us.

What is it that is stopping us? Do we feel too small? the problem too great? Do we see the solutions as involving technologies not yet invented? Do we share an overall assumption that others will sort this out for us? Surely, they must. We convince ourselves that this is best left to others but occasionally wish they would give an indication that they were up to the job. At the same time we watch our young children and grandchildren playing noisily and innocently, unaware of the possible terrors ahead.

We could stop feeling this way and do something. We could try and understand the fundamental causes of our increasing peril, we could look at the kind of thinking traps that people can fall into as they try to devise solutions, and we could explore the different motivations of people and organisations who air their opinions and proposals. Then, armed with this knowledge, we could press for ways forward to the different kind of world that is needed. These are what this essay is about.

The energy behind this essay
This essay is the result of a year of reading more than 30 books and papers, to try and overcome my ignorance and confusion about 'climate change', my growing distrust in government action, and a fear for the future of my newborn grandchild. In case you have not had the time to do this yourself I'm offering my summary of that reading, along with a detailed list of the texts drawn upon. Of course these are my 'take', and not some kind of absolute truth, and naturally both the choice of reading material and the conclusions I've reached were influenced by my own background which includes a London Business School MBA, 10 years based in a university department of Systems Science, 30 years helping clinicians in complex settings develop leadership skills, an ongoing exploration of secular Buddhism, and my mother- an early champion of our climate.
The choice was also influenced by happenstance, and this is an intelligent *layperson*'s take and I am not making any higher claims for it. I did, though, find things that amazed me, terrified and excited me and that helped me learn to distinguish between proposed solutions that will cause further danger and those that give us and our planet a chance. I'm writing this hoping it may convey some of that energy to you.

Warning! This essay is 20,000 words long, so it takes at least two hours to read. However it saves you at least two years of r*eading the texts from which it is drawn. [Isn't that too good a bargain to miss?!]*

Introduction

There is a lot of lip service to the dangers of climate change. We have become accustomed now to seeing it titled 'climate emergency' or 'climate catastrophe' but, in general, we are not treating it as such. How can we explain the rather mild and uninterested responses of so many people to even the possibility that our climate is perilously close to becoming so unstable and unpredictable that life on Earth as we know it may be in danger; that at the very least it will prompt hunger, want and war?

There is a phrase with which we are all familiar, 'I'm only human' and perhaps that is helpful here. Is it that, individually and collectively, *because* 'we're only human', our limited human senses and reasoning abilities do not readily enable us to grasp the nature and scale of the crisis we face? Not the amazing complexity of life on our planet, the immense damage we have caused it in the last 60 years as our population has trebled, nor the enormity of the impact this will have on our planet as a whole? My purpose here is to draw attention to things we have failed to notice, not because we are lazy or selfish, but because we're only human and the ability to do so hasn't been part of our genetic inheritance. We literally are not capable of 'seeing', of 'sensing', aspects that it is vital we understand.

When spaceships return to Earth many astronauts report feeling differently about their own planet. Watching an Earthrise, seeing Earth as the single 'blue dot', their appreciation for the teeming plenitude of life on our very special planet can be hard to put into words. Without that experience the rest of us fail to comprehend the scale and urgency of the crisis facing our very special planet's climate, still less its causes. Our senses are simply too limited, too human-scale, to allow it. To grasp the scale and urgency of our situation we have to widen our horizons.

In what follows, I first describe the six most critical areas where our senses and our imagination let us down so that we fail to fully comprehend the range of dangers we are in.
We then look at some thinking traps we can fall into as we try to design solutions. Understanding these can help be helpful when evaluating proposals put forward as solutions. Then we explore three distinctly different approaches to protecting the climate: three approaches and the different beliefs lying behind them. Unless we can identify these three when we come across them, we run the risk of adopting solutions that increase the dangers. I suggest we will need to learn to engage constructively with adherents of all three, but awarely, if we are to find ways of enabling our very special planet to continue to teem with life, including our own.

My aim in these three sections is to help us all evaluate proposals put forward by governments, advisors, industries, etc, not in scientific detail but as to whether they address the critical issues, use appropriate thinking tools, and care about what really matters. Then we consider how we can most usefully move forward ourselves, by now understanding more about what it is we face.

The arguments are drawn from a number of different sources, many of which are listed at the back. Where I have quoted from or drawn upon one of these, I give the name of the author in brackets in the text. This introduction is influenced by Ziya Tong's lovely book The Reality Bubble.

Six fundamental causes of climate change that we fail to see because we're only human

Cause One: How we obtain our food

The kind of food we eat and the ways we produce it are so different from those of our grandparents and great-grandparents they would be dumbfounded at what we take for granted. In 1885 more than 50% of the population (in Europe and the USA) worked on the land. Only a hundred years later it was 3%. In the C19 the average British worker spent twice as much on bread as on rent, so every

scrap of it was used. But bread consumption *halved* between 1880 and 1975, and now over 30% of it is thrown away. We no longer take choosing and purchasing it seriously and have lost our ability to judge its quality. How many of us nowadays can assess how much good wheat is in a loaf? how fresh was the flour used? Our forebears were much more discriminating (Bee Wilson).

In the countryside our grandparents would have known, small-scale farmers tended small fields that were surrounded by hedgerows full of berries, wildflowers and birdsong; birds followed the plough (occasionally looting crops but more often swooping for worms in the turned soil), and insects were abundant. Animals, for eating, were killed on the farm, or at a nearby small abattoir. The crops were mixed, chosen for their ability to thrive in local conditions, and rotated from year to year. Much of the food produced was sold locally: from the farm or in villages and market towns nearby.
This was not an easy life for agricultural workers, it was hard physical work for modest rewards but all of these activities contributed to a sustainably fertile soil: rich, fecund, plentiful, alive with microbes, worms, and insects - and also to a vibrant local economy (Chris Smaje).

Today very many hedgerows have disappeared, ripped out as small fields and family farms have given way to large scale industrial ventures. Farm outputs are now traded globally, and abattoirs are remote and huge. At the same time, there is no thriving local economy. Those villages, towns and cathedral cities once participating in a reciprocal local market, are now dormitories for people working in major metropolises or out of town retail parks. There is also little local variation in what is grown and eaten: globally only 12 plant species and 5 animal species now make up 75% of all our food. Of 7000 edible crops worldwide 95% of what we eat comes from 30 of them (Wilson).

How has this happened?

Over the last 90 years several revolutions have taken place, each, at the time, seen as game-changing advances. The *Haber Bosch process* provides more than enough nitrogen fertilizer to fertilize crops around the world, so there is no need, now, to rotate crops round small fields to keep their soil nourished and nourishing. *Pesticides* today remove any unwanted pests, and with them all the insects and wildlife that feed on them. Hence no hedgerows teem with the wildlife that contributes to a healthy carbon cycle, immense fields are the norm, stretching as far as the eye can see, their soil so lifeless that no birds follow the plough and the soil is a much less effective carbon sink. It is more accurate to think of these as sterile factories manufacturing grain than as fields abundant with life. *Dwarf varieties* of wheat and other annual arable crops, the Nobel prize-winning basis for the 'green revolution' of the 1960s, are hardier than their forebears and produce more grain. This is just what the, now global, food industry wants for its production of cheap staples and expensive luxuries so the range of grains produced globally has shrunk to a mere three staples: wheat, rye and maize (Wilson).

Each of these improvements has produced greater yields, reduced labour input and increased profits. This is seen as a highly efficient use of resources enabling populations to be fed as cheaply as possible. But we are now seeing the consequences: instead of renewing our soil we are depleting it, rendering it so barren that we may have only 60 harvests left (Ziya Tong) and instead of feeding our populations healthily we are leaving many of them simultaneously obese and malnourished. (Wilson)

That's an odd statement isn't it? But Bee Wilson's look at statistics and working practices is persuasive: large food companies (of the size of PepsiCo and Nestle) have changed both farming and eating patterns across the globe. They buy and sell globally with no commitment to farmers or consumers, workforce, communities, or even nations, only shareholders. Wastefully searching for soil worldwide, destroying natural landscapes and evicting nature of all kinds, has enabled them very

profitably to provide us with a lot of extra calories - although not nutrients. Now, delicious nutrient-free snacks of all sorts seek us out, at every store or garage we pass, and, courtesy of international development funds, in the most remote of third world villages. Some of the earliest users of the newly built roads paid for by those development funds are local sales reps of the global food giants, offering local shop keepers refrigerated cabinets to sell canned drinks and snacks full of non-nutritious calories. Not far behind are those buying rights to local land to grow wheat for the world market, or purchasing locally grown traditional staples such as quinoa for the middle classes of the global north. In this way nutritious local crops and varieties are put beyond the reach of local people (Wilson). Local indigenous people can suffer even more fundamentally as the ancient common lands on which they depend are bought by global food companies (from local profiteers): enclosures all over again (Tong).

A lot of this is done in the name of efficiency – of 'feeding the world'. But there are many kinds of efficiency and of productivity. Small local farms growing a variety of crops (root vegetables, tubers and leaves, arable grains) all chosen to be well suited to their local conditions, plus eggs and meat, are very productive and energy efficient. Animals provide fertiliser, traction and transport around the farm, and are also the source of healthy meat. Local crops flourish in their home soil and fertiliser use is kept small scale and specific (Chris Smaje).

This mixed, responsive farming requires skill and care, and offers rewarding and varied lifestyles. A hundred years ago small farms were the bedrock of vibrant local economies, and their human workers lived locally. The farms were part of a thriving local market: farm products sold from the farm, in nearby villages and the local market town and regional centre. They could be again (Smaje).

These agricultural and demographic changes have been taking place over the last century, but that thought can be misleading. The change has been at an exponential rate: in other words the scale and speed of change has become greater and faster over time, with small changes to start with and, now, changes on a scale almost beyond our comprehensions. 'If present trends continue it is estimated that in the next 50 years humanity will produce as much food as people have consumed over the course of human history' (Eileen Crist).

Each generation accepts the world they are born into as the natural one, ignorant of how it has changed over even the life of their parents. So we have no easy way of really grasping the magnitude of this 100 year desecration – but it will help us design our future if we do. I suggest we need to grasp and grieve the scale of this change in our land use and not ignore it. Our grandparents would be aghast at the landscapes we take as natural. Our grandchildren may be denied a future as a result.

It is not only our land that has been mutilated beyond recognition: so have our oceans. It is common for thriving, long lived underwater marinescapes the height of three storey buildings to be bulldozed by the now monstrously sized ships of the fishing fleets, devastating populations of ocean dwellers depending on them (WWF). Surveillance equipment ensures that shoals of even canny fish can be tracked and captured. Netting, using massive nets, ensures that about 60% of the fish trapped will be 'bycatch', species not for human consumption but caught all the same and sold as feed to fish farms. Prevalent destructive practices include extensive over-fishing in protected zones, stunning with cyanide, and ghost fishing (abandoning old fishing vessels with their tackle still in place and still entrapping any fish investigating them). There are many more abhorrences (including to the workforce on these ships) and globally our seascapes are as denuded and depopulated as our landscapes. We are now hearing that haddock stocks have been depleted to 1% of previous levels. Yes one hundredth. Halibut to 1.5%. This is where our imaginations can fail us again: a figure of 1% can sound innocuous. We are better at grasping this sort of figure with a visual image: imagine ten

rows of ten balls all red except for one green one. We've lost all the red ones. No not lost, destroyed.

I have not described (and will not) the ruthless and inhumane horrors of the global meat industry. This is an industry producing nearly 10 times as much meat as we need in our diets, along with its associated, very considerable, carbon emissions, while subjecting millions of animals (sentient beings let's not forget) to lives and deaths that would so horrify consumers that the US govt *forbids* any filming of such facilities. The scale of this industry is mind boggling: of all the mammal biomass on Earth 30% is us (humans), 67% is livestock we farm for our meat industry, and only 3% is animals in the wild (Tong).

Our food industry is trashing our planet. We have allowed it to focus on what is good for corporations and shareholders, and economic growth, and not on what is good for the soil, for other species, and for us. This is a long, long way from where we need to be if we are to have a planet we can live on. We need to eschew chemicals, synthetic fertilizers, large scale monocultures, and instead interact well with wild nature and feed people locally and regionally (Crist).

Cause Two: Population

Populations of all species are subject to the carrying capacity of their habitat: the resources available to them and their competitors in that environment. What is Earth's carrying capacity for humans?

Some economists claim that humans are not subject to carrying capacity constraints because of our natural ingenuity, and point to the massive growth in human population as proof. They fail to mention (or perhaps even to notice) that we have achieved this by stealing the Earth's capacity for carrying *other* species in order to do so.

In 1750 the global population was about 800 million. Largely as a result of sanitation, the industrial and green revolutions, as well as medical advances, today it is 7.7 billion. This is twice the number in 1972, and three times that in 1951. Comparing lifestyles (and mortality rates) then and now, it is not surprising that this is always described as progress. But today we still have between 800m and 1 billion people severely undernourished, with life expectancies not much greater than 250 years ago. Is this really progress? Is it the kind of progress we want? After all, when we see cancer cells overwhelming their host we also describe the cancer as 'progressing'.

To restore a healthily vibrant biodiverse planet we *have* to operate within limits. One of these limits is human population size. *What* that limit is is debateable, *that* there's a limit is not. There are laws of physics that not even humans can transcend. It is physically impossible to increase population numbers indefinitely.

Currently population growth has stalled in the global north. Indeed in many countries it is falling, with women's access to education, career opportunities and their sense of self-determination. Without these, many girls and women of the global south are still bound to a life of child rearing. It is in everyone's interest for us to support women the world over in their ability to undertake education and work of their own choosing, free from coercion from husbands, families and societies to have more children than they want. That requires excellent multifaceted education about sex and sexuality, relationships, gender and power dynamics, and means of contraception.

The global north can and should contribute substantially to these educational developments. More than that: we must consider that many of the countries of the global north are themselves overpopulated. With smaller populations their citizens would enjoy a higher quality of life with fewer impoverished, overcrowded areas of cities, fewer tensions over immigration, and, crucially, a

much smaller ecological footprint abroad. Consumers of the global north are the cause of most degradation of nature in the global south (Crist).

We need to see the population problem in terms of the human rights of girls and women to be freed from the social structures that force them into seeing their chief identity as that of motherhood. That may be in the developing world or among the disempowered inner city and rural girls of developed countries, who have lack of opportunity and low self-esteem. Empowering them through education and support, nourishing their talents and ensuring they have good information about childbearing and sexual contact serves them well, and the planet too. (Crist).

Using these methods, over the course of a century, the global population could fall to 3 billion without any coercion, only empowerment. It would be a return to the population level of 1960, within living memory for many. Indeed a level that informs the instincts of many of us, who have not realised just how vast the change has been. Will the global north accept its responsibility and step up generously enough to this challenge?

An even further reduction to 2 billion (Earth's population in 1930) is an ecologically sound and rational goal, enabling the conservation of a biodiverse planet, a connected global civilisation, a high quality and equitable standard of living for all people, and the co-flourishing of humanity with the living world. (Crist). It is also a feasible goal. If we chose to continue on this path a little longer, by 2200 the global population could be that size, allowing vast tracts of wild nature and a culturally diverse and inter-connected global civilisation.

With a determination to improve lives and using only excellent education and support for young women as they seek careers outside the home, reductions in population are both possible and planet saving.

Cause Three: Energy and waste

When humans lived in small, isolated communities, hunting and gathering as we did had only a marginal impact on the vast nature surrounding us. Over the millennia and generations since then, not only have our numbers increased but we have developed lifestyles that have required more and more energy from our surroundings, and produced more and more waste that we have needed to return to them. The result, today, is two massive and planet endangering industries.

Are you as amazed as I am that It takes just 3 tablespoons of oil to replace 8 hours of human labour? (Tong). This is what lies behind the phenomenal increase in global production of goods of all kinds since we discovered it. Whether this felt like a phenomenal boon (to the manufacturers and landowners) or bane (to those workers thrown out of work) there is no doubt that this changed the course of history. Prior to that we used renewable forms of energy (wind, water, wood, animal fat, vegetation..) but the switch to non-renewable, irreplaceable, sources such as coal and oil gave us the Industrial Revolution. Today our energy comes almost entirely from non-renewable sources: coal 27%, natural gas 24%, oil 34%, with renewables of hydroelectricity 7%, and other sources 4%.

Let's look at what this means:

- It takes 23 tonnes of pre-historic life to make 1 litre of petrol.
- Every *day* we are using the fossil fuel equivalent of *all* the plant matter that grows on land and in the oceans over a whole *year*.

In other words we are *using and emitting 365 times as much as Earth would naturally handle.* It is therefore not surprising that Earth's natural system of mutually dependant life forms finds it difficult to handle in one year emissions that would naturally have taken place over several centuries,

especially as we are simultaneously reducing the surface of Earth carrying the natural biosystems that would previously have helped absorb them.

This is extremely hard for us to picture, to imagine, to gain a felt sense of, and for all our endless talk about emissions we very, very rarely do try to picture them.

Some populations are depleting these resources and contaminating our atmosphere much more quickly than others. The world as a whole used 14 billion tonnes of oil equivalent (TOE) in 2019, an average of 58 TOE per person. But the figures for different countries vary widely: USA: 230; Germany (representative of Europe): 125; China: 75; India: 19. There are great disparities, too, between the most and least wealthy within a population, leading to grossly different life expectancy and life experiences.

Earth cannot afford us to be rich, if being rich means consuming this much energy.

But that is only half the picture: the consumer society resulting from our use of fossil fuels is also an increasingly wasteful one.

Again, countries vary in the amount of waste they discard annually: figures for general solid waste per person ***per day*** are:

- USA and Australia: **> 1.5kg**
- Most of Europe, some of Asia: **1-1.5 kg**
- Rest of Asia and most of Africa: **0-1 kg**

In total 2.01 billion tonnes were discarded in 2016, when the population was 7.4 billion. That's about a quarter of a tonne per person, and remember that this will be as unevenly spread as is energy use, indeed it's distribution is exactly the same as energy use, it is the energy used that leads to the waste. A small car weighs about a tonne, so if we were disposing of our own waste we would need to find a way of *getting rid of a small car every four years*. Can you imagine how you would do that? How would you do that without disturbing natural habitats? Again and again for your lifetime? The prediction is for 3.4 billion tonnes by 2050, that's 340 million million (340, 000,000,000,000) small cars … to be disposed of every year, even imagining that is difficult. The threat this poses to Earth's natural biosystems is terrifyingly huge.

What is more, we are being encouraged or even forced to discard items unnecessarily. Many manufacturers now build obsolescence into their design, and deliberately prevent us from finding ways of repairing them. This is what lies behind the calls for a 'right to repair' and for much longer warranties. Some industries are explicitly built around waste. The fashion industry for example actively induces us through its massive advertising budgets to tire of and discard clothes that are still perfectly serviceable, just out of date. This is what lies behind calls for strict limits to advertising budgets.

The scale of international shipping is something else most of us are blind to. We have not noticed just how vast container ships have become, how few people are required to man them, and how extremely cheaply they convey massive amounts of goods of all sorts from one side of the world to another. It has been likened (John Lanchester, LRB May 2021) to the physical equivalent of the internet, almost costless to those using it. Nor have we noticed with more than fleeting interest just how many roads are being built across every continent by the world's greatest exporters, predominantly China, with the aim of increasing trade still further. There are certainly more of us than there were 60 years ago but that does not account for this increase in trade: that is down to us in the global north buying much more than we need, or even want, and quickly discarding it.

When discarding waste we are discarding, too, any energy used in its manufacture. So, for example, when households throw food away, they are also throwing away all the energy used to grow and process that. In the USA the amount of energy bound up in one year's food waste happens to be equivalent to ALL of the offshore gas and oil reserves being drilled in their country that year (Tong). Isn't that astounding? I wonder what the figures are for my household. I'm not wilfully careless but do throw away more than I used to when it was more common to shop several times a week.

As a species we are continuing to use habits that were sustainable when our numbers were smaller and nature was still abundant. Today those habits poison and damage on a scale we do not see and find difficult to imagine, here are a couple of examples:

- 85% of the nitrogen fertilizer used on fields is *not* absorbed by arable crops but runs off into rivers and lakes. Here it causes deadly 'blooms of algae': dense clouds of algae causing large dead zones in seas and rivers all around the globe by preventing vital light and oxygen from entering the water and suffocating everything underneath it.
- Those recycling bins in our houses (yes, our houses in the global north) lead to huge mounds of unusable, non-degradable waste plastic, unceremoniously dumped on common land around impoverished villages in the global south. Why? Because the waste handling companies are overwhelmed by improperly sorted waste from Europe and the US.

But I have omitted to mention one aspect that has a particularly huge impact on the overall amount of both energy and waste.

Inequality.
Inherent in all life's species is an element of competition. Uniquely, though, homo sapiens has created means of multiplying accumulated advantage over the generations, mostly because of the invention of money. This means that life chances in today's world are hugely (almost unimaginably) unequal.

In the UK the top 20% of earners take home 40% of the national income – and that is after a considerable amount of redistribution has already taken place through tax and benefits.
The bottom 20% take home 8%. Even this understates the inequality: the top 1% take home 13% of that national income and figures for the top 0.1% are even more startling.

To gain a sense of the scale of this inequality consider this: only 50% of the UK population are in jobs steady enough for them to be able to plan their lives and finances 6 months ahead. This is likely to include you and me. Of the rest about half are able to plan over about a month, a quarter over a week, and 10% over 2-3 days (John Hills). I find it difficult to even imagine the skills and strength of character I would need to deal with a situation like that.

That is the inequality within a country, that between countries is even greater.

Why does this matter? For two linked reasons.

1. Rich people and rich countries use much more energy and produce more waste than poor people do. Countries with higher GDP per capita have much greater ecological impact. For example: In India the meat consumption per capita is 4kg a year, in the US it is 120kg. The material footprint in low-income countries is 2 tons per person per annum, lower middle income 4 tons, upper middle income 12 tons, high 28 tons, US 35 tons. The sustainable amount is 8 tons (Jason Hickel).

2. In countries where inequalities are lower people consume less energy and produce less waste. It seems that in unequal societies we buy many additional products to 'keep up with the Joneses', to give us a sense of self -worth.

There is evidence that in societies with unequal distribution there are greater feelings of unfairness, lower social trust, less solidarity, poorer health, more crime, less social mobility, more anxiety, insecurity, depression, and addiction (Hickel). Inequality isn't helping our economy and still less our society and it is also destroying the planet. Furthermore, it is not an inevitable state of affairs it is the result of choices made for us by the economic policies pursued by governments. It is also growing. Since 1980 46% of all new income from global economic growth has gone to the richest 5%. The richest 1% capture approximately a quarter of global GDP.

It does not have to be this way.

Cause Four: Challenges to Earth's Plenum

Plenum is not a word we use often. Personally I was more familiar with the related word 'plenitude' than that of plenum, but it's meaning makes it perfect for describing our planet, Earth. It means '*a space, of which every part is full of interacting matter'.*

Earth is a plenum, 'an unimaginably wondrous plenum: of diversified kinds, abundant numbers, different ways of life, and exquisitely convoluted relationships – all unfurling as a slow-motion upsurge of biodiversity over geological time'. I love that quote, found in Eileen Crist's book, but, if it doesn't speak to you, you may prefer to imagine a David Attenborough depiction of life in a vibrant tropical forest. In either case we imagine a plethora of species, all inter-dependent, feeding on and in turn feeding other species in a wonderful circle of life. Different climates and terrains have their own ecologies filled with interdependent plants, animals, fungi and other life forms that thrive in their specific regions, climates and altitudes.

We are part of this plenum, but we perceive and comprehend only some of it. What's more we don't realise how very much we don't know. Here is one example from Ziya Tong: 'our planet is surrounded by a literal bubble of bacteria - NASA experiments found 5,000 species in a cubic metre of air at 33,000 feet - and we owe them our lives. And yet, so far only 0.001% of those microbial species are known to science'. Here is another: James Lovelock speculates that 'it may be as impossible to have a planet sparsely occupied by life as it is to have half an animal'. Among other things, what he means here is that our climate is an outcome of the nature of our planet as a whole, that Earth's biodiversity and its climate are inextricably linked (that is why, in this essay concerned with our climate, I have paid so much attention to biodiversity). What is more, as we're only human, they are linked in ways that we do not and probably will not ever fully understand.

Earth is a living system. It's what systems and complexity scientists call a 'complex adaptive system', a term which doesn't do it justice but means, among other things, that Earth's responses to interventions made by humans will be unpredictable.

Let's say that again: **Earth and its atmosphere and their plenum will not respond predictably to human interventions.** I've put that in bold because it is so important, and it means that we have to approach our relationship with Earth with humility. Instead, all too often, we do so with arrogance: we look through the lens of one or other expertise and presume to understand the impact of interventions we might make. Human knowledge is necessarily limited, but is even more so when trapped within subject silos. To get closer to understanding it we need to bring insights from all those subject areas together, but even then, as one animal species evolved from within it we will

never be able to understand it completely. We simply do not have all the senses that would be required.

Let's stop for a moment and wonder at it. Because by any measure Earth is amazing, wonder-full. As Tong so evocatively tells us: Almost all of the matter that surrounds us came from the death of a star. Some atoms are even from other galaxies. About half of the matter in our own bodies isn't even from the Milky Way. And some is as old as the Big Bang itself: 98%of the hydrogen atoms in our own bodies are. Just as amazingly, Earth's water is older than the sun. The water we drink has been a cloud, an iceberg, a wave, 3000 years in the ocean and a week in the sky before falling as rain. In glaciers it can rest for hundreds of thousands of years before joining streams , then rivers and the sea (Tong).

Evolution on Earth has led to multitudinous forms of consciousness, perception, and natural abilities. There are 8.7 million other animal species, each with its own way of perceiving. Because other species have senses we either don't have or have in a less developed form it's almost impossible for us to fathom *how* they relate to their environment. This means that the thought of us conducting Earth as a kind of orchestra, when our perceptions are so limited, is laughable. We must stop destroying it, and help it to recover, but not presume to impose our solutions.

Above all else, Earth's natural plenum needs space, but that is the very thing we are constantly encroaching upon. Indeed we are not so much encroaching as stealing - at scale and at speed. Nature needs large areas of wilderness, occupying at least half of Earth's surface area (EO Wilson quoted in Crist), but we have already devastated more than that and are currently destroying natural habitats, according to Global Forest Watch, at a rate of a *football ground* every *second*.

What *is* 'wilderness'? It's the matrix within which more and new life emerges, and within which life is sheltered and sustained (Crist). It's an area of land and water, largely free of people, big enough to support species that need expansive spaces in which to live, disperse, and migrate; and where a rich array of biodiversity allows organisms of all sorts to interact, multiply and evolve, and sometimes become naturally extinct. (There is always a rate at which species become naturally extinct. Today the extinctions resulting from human activity are 1000 times that background rate).
Wilderness requires *large* contiguous areas with no human habitation, areas connected to each other by wide 'corridors', and with buffer zones abutting the areas where humans live.

This is what has been lost, these large scale roaming areas. We urgently need to stop plundering and start rewilding. The two major culprits here are the global food industry and the infrastructure for wider global trade (e.g. roads, ports, hydroelectric dams). Between them they have largely destroyed wilderness in both developed and developing countries across the globe. Did we really imagine that those salmon tunnels and frog bridges were a substitute for a healthy river or a road-free field?

Global trade? We're so used to celebrating this, and encouraging its further development that we are surprised when we realise that 'global trade' is at heart a process of the global north exporting to the global south the ecological destruction it requires for its own massive consumption and waste. Somehow we have not noticed that between 1970 and 2010 the Earth has lost 60% of wild animals, and 81% of animals of lakes, rivers and freshwater systems, nearly all because of the global food industry and the roads, ports, factories and other infrastructure built to support global trade. Nor that as developed countries exported their nature-destroying footprint to poorer countries global trade became a virtually unrestricted flow of commodities directly at the expense of the natural world (Crist).

Cause Five: Human supremacy

Pay attention to the language used in any form of mainstream media, any conversation between friends or colleagues, and …. well, anywhere humans are using language, and you will find that underlying everything else is an implicit assumption of human superiority over other species – and our right to that supremacy.

This feeling of supremacy is so all pervasive it is invisible to most of us and therefore unchallenged, even unchallengeable. There is some debate among anthropologists about when this developed, perhaps with the invention of the plough and the move from hunter-gatherer to agricultural communities. But it certainly flourished in the Axial Age (the period 3-2,000 years ago when most of the world's great religions began and Greek logic flourished). It seems that as we enhanced our abilities to guide nature for our own ends, we assumed a separation from it and a superiority over it. Now we take it for granted, we don't think about it, consider alternatives, examine or explore it. We don't look at the richness, the amazing abilities of other species, the exquisite mutuality of an ecosystem that is completely beyond our ability even to chart let alone control.

This invisible supremacy is manifest all around us and, crucially, in our language. We talk of 'natural resources' when we want to use any aspect of nature for our own benefit; of 'livestock' and of 'fisheries, rather than of particular animals or fish. We take a human invented concept - money - and presume to attach different quantities of it to nature's creatures, as their 'worth' according to their use for *us*. Yet these organisms have standing of their own. They have features, senses and abilities of their own, only some of which we share – and some we cannot even begin to imagine.

Consider these insights, again from Ziya Tong: X rays invisible to us can be seen by some other species. Bees can see UV light, so pollen is brightly lit for them. Golden eagles can too – they can spot a rabbit from 1.6km away (comparable to us seeing an ant from a ten storey building). Dung beetles use the Milky Way to navigate. Dragonflies have 30 light sensitive proteins (we have three, giving us the sense of three colours: red, blue and green), they see a palette of colours literally unimagineable to us. Homing pigeons can distinguish different letters of the alphabet, and between paintings by Monet and Picasso, and recall up to 1800 different images. We cannot begin to imagine how the world appears to any of these (Tong)

Nature is amazing. Other species are amazing, many in ways unknowable to us. Our ways of seeing and engaging with the world are so very different from those of many other forms of life, surely this should inspire our wonder, our respect, our heartfelt desire to let them flourish. Instead 'we somehow don't see as immoral the increase in human freedoms that has come at the expense of domination and exploitation of the natural world. We need this to be as unacceptable as slavery' (Crist).

Many indigenous people have a respect for all beings and a restraint in exploiting nature. They focus on reciprocity, kinship and gratitude. They tread more lightly and focus a lot more than we do on regenerating. 'According to our way of living and our way of looking at the world, most of the world is animate, we have come to believe that they have spirit, they have standing, on their own' Winona Laduke (indigenous author and activist, quoted by Crist).

'If we see human supremacy as natural, then we can conceive of and develop techno-managerial fixes for the climate crisis: stealing yet more of Earth's nature to absorb sunlight or turn life-filled rivers into hydroelectric dams' (Crist). Our mathematical calculations tell us how many photo-voltaic cells will decrease carbon emissions to cool Earth by how many degrees. We believe we can understand and predict our impact on Earth's weather – a set of dynamics influenced by a myriad of factors, at least some of which are well beyond our current knowledge.

If, instead, we see humans as *one* of Earths' creatures, part of and dependent on the rich interactions of Earth's plenum, then we make very different proposals. We see that 'nature now requires protection at enormous scale and huge urgency, with local people acting as its partners not its overlords' (Crist).

It is not only the countryside around us that has changed as we cultivated it and drew more energy from it – *we* have too. We have changed both psychologically and socially. Our societies have expanded and grown more complex and our personalities have changed with them. In 1887 with the Industrial Revolution well under way, German sociologist Friederich Tonnies observed different behaviours between rural and urban dwellers. He noted country dwellers having strong family and community ties, close personal relationships, and a distrust of people behaving outside local norms, while the city folk had social relations based on impersonal ties, valued freedom of movement and expression, and were more permissive in their beliefs about sexual orientation and other forms of lifestyle that lay outside the mainstream of society. Crucially the latter also used more energy in their lifestyles (Stephen Quilley).

As these behaviours were associated with different levels of energy use we cannot be completely certain that a reduction in our own use of energy will not affect our personalities, behaviours, values and beliefs. It is at least something to bear in mind so that old prejudices are not reasserted or new ones introduced as we try to reduce the amount of energy we consume (Quilley).

But as well as human supremacy, or as part of it, Earth is now subject to the dominance of a particular way of thinking.

Cause Six: The Dominance of (a particular form of) Economics

Of all the social sciences economics is the most influential: governments around the world make decisions affecting many aspects of life and livelihoods for their citizens and society based on advice from economists.

Economics, though, is a contentious subject. It is a social science, open to debate and interpretation in a way that physical sciences are not. It offers insights that can be interesting and valuable but are rarely definitive. So it should be treated as a prompt for thought on the part of policy makers, and not as a recipe for action. Just as historians contest understandings of a particular history, and sociologists offer differing insights into the dynamics of society, so the analyses and recommendations of economists differ across the subject area. Just as there is often a commonly held view of a particular historical event that is overly simplistic and insufficiently nuanced, so too in economics.

I found it helpful to discover that observers of the field of economics find a number of competing schools of thought:

- a *mainstream*: the ideas held by dominant individuals in leading institutions and journals
- the *orthodoxy*: the most recently dominant school of thought, several important aspects of which many in the mainstream now reject. (For much of the last 100 years this has been neoclassical economics, in which analyses focus on the optimising behaviour of fully rational, well-informed individuals)
- the *heterodox*: economists who work outside the frameworks of the mainstream. We might class Modern Monetary Theory as an example of a heterodox strand that is perhaps moving to the mainstream (it's been heard in Biden's Whitehouse)
- an *elite* which includes some Nobel prize-winners and most major chairs of top graduate programmes who are often relatively openminded about new ideas. Interestingly it is not

usually the elite who suppress the heterodox, but 'mediocre' members of the profession and influential *non*-economists (Colander, Holt, Rosser).

Unfortunately, politicians and journalists often advocate an orthodoxy that suits their own purposes. I'm not suggesting that they deliberately pick and choose from competing theories the one that suits them best, although undoubtedly some will, but that they are drawn to those that fit their general worldview. Sadly the orthodoxy that many espouse today is a planet destroying one. It is rooted in an assumption that people are naturally *selfish* and *compete* with each other for *resources* that are inevitably *scarce*: that we all naturally behave as 'homo economicus'.

This view is contested by many historians and heterodox economists. They observe that our own forebears had to be forced into those behaviours through the vicious, inhumane Enclosure process that took place across Northern Europe in the 1500s and proved to be the foundation of today's capitalist economies (Karl Polanyi, Hickel). Records of the Mont Pelerin Society also show that Friederich Von Hayek, whose book The Road to Serfdom was a favourite of Margaret Thatcher's, argued in the early 1970s against giving countries that were ex-colonies the right to determine their own economic future, insisting that only northern Europeans were capable of thinking in the self-interested way that market economics required, and that other peoples had to be *forced* into the habits of a market economy (Jessica Whyte).

We do not have to believe that we are inevitably driven by greed and selfishness and that this is a good thing. We can enjoy our natural empathy for others and invest in generous relationships with others in wider society as well as friendship circles and families. We can ask our governments to do so too by consulting economists from across the breadth of the profession and not only one strand. Better still, to consult much more widely altogether: sociologists, historians, ecologists, physicists, and more, with economists taking their place among them rather than atop.

Greed is not the only dangerous economic myth we must challenge. Just as important is that of growth. Economic growth is the increase in the amount of goods and services traded over a specific period, and governments pursue it in the belief that increasing the size of an economy (its GDP, gross domestic product) leads to longer and wealthier lives for its inhabitants.

The last century has indeed seen amazing changes in working lives, standards-of-living, and life expectancy, at the same time as there has been considerable economic growth. Governments around the world want to deliver higher living standards for all and to increase the living standards of the poorest in society and they prefer to do this without taking (unpopular) action to transfer money from the richest. They believe that economic growth allows them to do this.

This belief results largely from mid C20 analyses of two physicians, Thomas McKeown and Samuel Preston, who each observed an association between growth in GDP and increasing life expectancy. However the data supporting these conclusions reflected a particular 80 year period (1870-1950) in which mass sanitation projects led to large rises in public health (Hickel). Growth certainly accompanied increasing life expectancy at that time but cannot be said to have caused it.

Thus we cannot rely solely on growth to deliver higher living standards for the poor, firm government action will always be required. Action of the kind that took place in the West from the 1940s to the 1970s but that we have not seen from the 1980s onwards. Since then all the gains from growth have accrued to the already wealthy, many of the poor have become poorer, life chances have become more unfair, economic performance has weakened and social tensions have increased. This is what happens when governments avoid their proper responsibilities. If we want fair societies

with people looking out for each other as well as themselves we must intervene to redistribute income where it has become unfairly unequal.

Without appreciating how shaky is its rationale, international organisations dominated by the West, such as the OECD, IMF and WTO, have required countries around the world to grow their economies. They have done so with the best of intentions (probably). They may have been unaware that such growth has always involved the capture or destruction of part of the natural world, exploitation of countries with lesser bargaining power, and of people forced to take jobs on scandalously low wages, or they may have believed these were necessary evils.

As early as 1977, (influenced by the 1975 report 'Limits to Growth', by a group that included two excellent Systems theorists and modellers) Herman Daly introduced the concept of *Steady State Economics*, observing that we need our economies to be in a state of dynamic *equilibrium*, in the way that an ancient and vibrant forest is. He gave us four rules for a steady state economy:

1. Maintain the health of ecosystems and the life support services they provide
2. Extract renewable resources (e.g. fish and timber) at a rate no faster than they can be regenerated
3. Consume non-renewable resources at a rate no faster than they can be replaced by renewable substitutes
4. Deposit waste no faster than it can be safely assimilated.

Here, in the kind of economy Daly describes, the real world retains its place of critical, vital importance, a world created by and subject to natural laws of physics and biology. Through this lens we can choose to see our relationship with Earth and its multitudinous inhabitants in a different and more enjoyable way. In 1977 these recommendations were aimed at avoiding the destruction of Earth's plenum. Now that we have already destroyed so much they are even more urgently needed.

It is *vital* that we stop our economies growing, that we stop the plundering of nature, the grossly unfair exploitation of the global south, and the ever-increasing inequality in the global north that economic growth requires. Not just because of the cruelty and suffering involved, but for our very own benefit: *economic growth* ***prevents us from achieving any reduction*** *in harmful emissions.* Unless we stop our economies growing, *every* advance in developing new forms of energy or low energy consumer goods is instantly counteracted by the greater economic activity. Our technological developments will *never be able to keep up*. This is not a new observation and it has a name, the Jevons Paradox, coined in 1865: that any new technological efficiency never *reduces* the use of resources but *increases* it as people increase their consumption accordingly.

So what do we want instead of growth? Perhaps degrowth? There are many different understandings of degrowth, including some that serve vested interests more than those of the whole planet. A healthy description includes: reducing the material and energy throughput so that we reach an equilibrium with the living world, while distributing income and resources more fairly, reducing needless work, and increasing public goods which help people to thrive (Hickel). To achieve this we need to measure not GDP, which becomes irrelevant and may rise or fall, but all of *these* parameters.

As it happens we have some examples of this in action. After the countries of the Global South, ex-colonies, had gained independence in the 1950s they pursued a path of protecting domestic industries, improving working conditions and wages, and setting up systems of public health care and education. In the 1960s and '70s they borrowed modest amounts from Western lenders to set

this in train and were servicing those very satisfactorily while successfully growing their economies and enabling their societies to thrive (Whyte). It can be done.

Sadly, when the USA had a currency crisis in the 1970s, largely due to the cost of the Vietnam War, Paul Volcker (head of the US Federal Reserve) increased interest rates to punitive levels and these ex-colonies were suddenly unable to service those debts. Financial markets forced them into Structural Adjustment Programmes, requiring that they cut their government spending, and open up their economies to global trade. They were required to privatise public goods, to reduce tariffs, wages, environmental laws, and social care, to focus on exporting only raw materials and commodities to the West and rely on the West for imports of anything with a greater profit margin. In this way the wellbeing of the people in these countries was sacrificed for the profits of Western companies (Whyte).

The view propagated in the global north is that people in the global south are poor because they are not able to access the global economy. This is the reasoning behind global trade deals, but the reverse is the case. Trade deals allow multinational companies to exploit the fact that there are few local businesses able to compete with them to pay much less than they are worth for labour, raw materials and natural resources. It is money and its owners that do well out of trade deals, not local populations (War on Want) and certainly not our planet. Between 1970 and 2010 the Earth has lost 60% of wild animals, and 81 % of animals of lakes, rivers and freshwater systems, nearly all because of the global food industry (Crist). As developed countries exported their nature-destroying footprint to poorer countries global trade became a virtually unrestricted flow of commodities directly at the expense of the natural world. Global trade has systematically transferred wealth from the workers of the global south to the middle classes of the global north (Crist).

Capitalism is well named, that is what it does, look after capital and its owners. We forget that capitalism is not the only option, that there are alternatives to it that do not involve anything like communism. People have traded with each other for millennia, long before capitalism was forced upon us 500 years ago. There were codes of trading conduct and there were rulings by elites that kept the market thriving. One such feature was the Debt Jubilee, introduced by rulers when markets had become skewed. (David Graeber).

We need trade and we need markets but we, humans, do not need those to be global. It is capital that benefits from globalisation, not us. People in the countries of the Global South would be much better off operating in a local economy not a global one, meeting local needs rather than creating excess profits for companies in the global north. (Hickel, Stephanie Kelton).

Is it at all realistic to imagine a different kind of economy? Won't people want to go on buying and buying as they do today? Tim Jackson talks of us 'spending money we don't have, on things we don't need, to create impressions that don't last, upon people we don't care about', which rings a chord with many! But is this really our choice? Or has it been foisted upon us? What else are huge advertising budgets for? Isn't that feeling of discontent with our current sofa being artificially fostered? Who benefits most from our discontent? The owners and lenders of capital.

If we look at capitalism more carefully we can see it as a creator of an artificial scarcity, of a sense of lack that has been created by people who benefit from us feeling that way. It is also, despite its claims to the contrary, a major cause of inequality. In more equal societies and without those induced feelings of dissatisfaction, most people are content with having *enough*, and value their leisure and friendships as much or more than consumer goods. We want fulfilment, variety, community, family and friends, effective and efficient services and support. None of this needs

economic growth. Instead of measuring the size of our economies politicians could focus on how their citizens can find *these*.

This is not unrealistic, there are countries today whose people have a good standard of living while living within or much closer to healthy ecological limits. Portugal, for example has higher levels of human welfare than the US with $38k less GDP per capita than the US. Isn't that intriguing? Let's put it another way: if the US were to distribute incomes equitably and invest in public services it could reduce its economy by 63% and have higher levels of human welfare than it currently does (Hickel). It would be a different way of life for many (both for those currently better and worse off financially) but a good way of life that would allow us to achieve all our social goals for everyone in the world for a lower GDP than we have now (Hickel).

If we are to make that transition (from our main pastime being shopping) we will need to refocus our lives. We could focus directly on our contentment with life, rather than on the goods we buy in pursuit of it, by actively developing the skill of being content. If we believe we are, at heart, children in a sweet shop, constantly wanting more and more new things, we can either go on renewing the stock in that magical shop or grow up and learn how not to be seduced by it. Many sages over the millennia have given valuable guides on how to observe our minds and become aware, and even amused, at the constant stream of cravings that assail them. With practice we can learn to let those desires arrive and depart, the metaphor often used is that of clouds passing across a sky, without us having ordered a new outfit on the internet.

We can wean ourselves off growth. We can pursue contentment with what we have, in place of an increasing standard of living. We can teach ourselves how to be content and identify specific lacks instead of hosting a generalised desire for more of everything. Without the sense of scarcity that capitalism artificially generates within us, we can see the world as abundant. Would we welcome liberation from the burden of pursuing material excess? Might we then see that 'consumerism is a gross failure of imagination, it degrades nature, and doesn't even contribute to the universal human craving for meaning' (Crist).

We will need to develop a new kind of economy, one in equilibrium with the living world, one where work adds real value rather than simply company profits, one where there are more public goods aimed at communal and individual thriving (Hickel).

Without global corporations seducing us into planet endangering consumerism we will have time to become multifaceted, integral members of communities, relating to each other very differently from the way we do in our current dominant identity as consumers.

There is however a major pre-requisite for such a society to thrive: that local regional economies take the place of our current global one. Within such economies food and goods would be traded freely, but trade between those economies would be tightly regulated. In this way trade would offer benefits to all involved and not only to the major global companies who press for and are the beneficiaries of these international trade agreements such as NAFTA and TTIP.

Much thinking has been done by some ecologists about Bioregions. Eileen Crist describes these as geographical locations with distinctive topography, animal and plant communities, animal migrations, and other unique features, and notes that their fairly stable and recurrent natural patterns would provide distinctive sources of livelihood, vistas, lore, and feel. In other words, in place of the boundaries we have today that are rooted in human wars and conquests, boundaries could be placed around different kinds of naturally occurring ecosystem.

I know: …… fanciful? …… Yees, …….. but ……. what a world that would be.

Five thinking traps we can fall into because we're only human

If we are to design solutions to our planet's crisis that honour its complexity of life and increase our chances of our own survival we may need to overcome some common thinking traps to which, as fallible humans, we are prone. They are thinking traps that have evolved or strengthened over the last 50 years – the time period in which we have done the most damage to our planet. They have contributed to the dangers we are facing and will prevent us from dealing with those dangers.

Thinking Trap One: We confuse complex problems with complicated ones

Systems thinkers in the '60s and '70s drew a distinction between puzzles, problems and messes. A *puzzle*, suggested Russell Ackoff, is a situation where there is a *right* way forward and we can find out what that is. A *problem* doesn't have a right way forward but some ways will be *better* than others and we can consult experts to see what they are. A *mess*, though, is very different, it's a complex system of interacting problems and puzzles, and here we can only take a step forward, see what happens, and then decide on our next step. Charles Lindblom called this 'muddling through' and, when done well, 'muddling through elegantly'! At about the same time C West Churchman, introduced the concept of a 'wicked problem, which shares many of the features of a 'mess'.

How many 7s there are in 42 is a puzzle, so is putting together flat-pack furniture, and prescribing treatment for a well-understood medical condition. So, too, is building a spaceship or a wind turbine.

Changing a cake recipe when you lack certain ingredients might qualify as a problem, so might deciding how to handle a toddler's tantrum, or what to plant in a newly dug garden. Deciding where to site your wind turbine might fall into this category.

Puzzles and problems may be simple or more complicated, but they are not complex. Complex means 'difficult to understand or address because there are so any *interacting* parts'. The way the parts interact may be different on different occasions or in different circumstances, and will not behave predictably. Deciding how to respond to a teenager experimenting with drugs and refusing to go to school is not straightforward. This is what Ackoff called a 'mess'. It needs sensitive, situation specific handling, trying one approach and if necessary another and another. It is complex and unpredictable.

Since the 1970s, though, when these systems scientists were in their heyday, we have 'numberised' the world. We have lost our ability to make judgements in complex situations, and our preparedness to muddle through or accept that some problems are indeed 'wicked'. We expect definitive answers where there are none. 'Which is the best school for my child?' 'Look at the league tables'. Yes but that tells you the school best at gaming league tables; not the best school for your particular child. For that you have to visit, chat, listen and look for clues, and reach a judgement of your own based on your knowledge of your child.

Earth's climate is not a tidy puzzle with solutions that will deliver reliable consequences. Some aspects of it are problems, where we are pretty sure that some ways forward will work better than others. But in essence it is the most highly complex system, the messiest mess, we can imagine. Indeed we *can't* really imagine it, it is still essentially unknowable. We certainly will not be able to intervene and be confident of the result of our interventions. It *requires* us to 'muddle through', tentatively and humbly trying all sorts of different approaches, approaches which safeguard and do

not threaten the full plenum of life. We will need overarching ethics and principles, all offered thoughtfully and implemented sensitively, reviewed and rethought. A strictly adhered to, technology-based, rigid master plan would be likely to lead to disaster.

This requires very different skills from designing computers, or running banks, and we must not be seduced by ideas from people whose skills lie primarily in those areas. Perhaps our recent experience of how SAGE and Indie SAGE have approached and offered guidance for policy makers during the Covid pandemic sets an interesting example. Their noisy, evidence averse, self-centred opponents exemplify the opposite.

Thinking Trap Two: We mistake the role of money

Making changes of the kind Earth now needs will require financial investment of some sort. It will involve a lot more than money, (determination, persuasiveness, consistency of purpose, international diplomacy of a kind never seen before, legislation and more) but many aspects will involve new money of some kind. Where will that come from?

Because 'we're only human' we assume that governments must run their budgets like a household does. But governments with their own sovereign currency are very different from households because they can legitimately print their own money. As long as the project is sound and will yield results of value to its citizens these governments can spend as much as they like until their spending causes inflation, and then they can address the inflation by taxing money out of the system again. Government spending always comes before it raises taxes, not the other way round. Alternatively or additionally governments can sell bonds (gilts) to people wanting to invest their savings somewhere safe over the long term - and governments are a safer bet than corporations. Or they can borrow from the finance sector.

In other words, if governments are investing money wisely they need never run short of it. This is a very different understanding from that propagated by mainstream media and many economists and it warrants further exploration (Kelton, Graeber, see Kelton for a very readable concise argument and Graeber for a gloriously expansive long one.

At the same time, individuals investing in, for example, their own business, will likely borrow from banks and building societies. What is essential for this kind of borrowing is that any money lent is cheap, but hard to get. This is what ensures that the resources being purchased with this money are being used to the very best effect. The business case supporting it (which must now demonstrate that it contributes to restoring (or at least not damaging) Earth's plenum) must be expertly scrutinised and, if the proposal is sound, the money lent at a very low rate of interest.

Currently our financial system is doing the opposite: making credit *widely* available for whatever borrowers wish to spend it on, thus directly causing the very problem we now need to address: a plethora of consumer 'stuff' that adds little value to people's lives and destroys the natural world as it does so. Reforming the finance sector will be critical so that it focuses on types of wealth that the *planet* can afford. Imagine an interest rate dependent on the impact of a project on the planet.

That is worth repeating: it is us being tempted by ready credit that is causing a large part of the problem. This has been one of the causes of the current glut of consumer 'stuff' bought and soon thrown away that forms the mountains of waste discussed earlier. As 'we're only human' and we've been taught that this is OK we will take some re-educating, but we *can* rediscover our humanity and take pride and joy in investing in rich, fecund landscapes instead of yet more (often rarely used) garments in our wardrobes. Strict conditions and high interest rates on loans for consumer spending will help here.

Governments' lack of money must never be reason for delaying action to save our planet: governments and banks can and must make it available cheaply albeit subject to stringent appraisal from people with relevant expertise and deep understanding of Earth and its plenum.

Thinking Trap Three: We think cities are more energy efficient than the countryside

We are used to hearing that cities are good for the environment, because people in cities use less energy than their country cousins. But that is not always true. Indeed cities in general use resources and produce wastes and pollution disproportionate to the size of their population (Smaje). There are a number of reasons for this: the wealthiest people tend to live in cities and the wealthiest people consume disproportionately more than others; cities are continuously built and rebuilt with all the attendant use of resources; and the higher rate of innovation in cities leads to adoption of higher energy lifestyles (Quilley). Yes, there is much better public transport but with the plethora of activities readily available, city folk make many more journeys.

Some cities, however, have a healthy impact on their surrounding economy, while others actively impoverish them. Chris Smaje uses the term a nested economy. Here a number of local farms and other producers, villages, market towns and a regional county town or city form a dynamic, sustainable economy with goods and services flowing backwards and forwards between all of them. Cities that only draw services inwards, ordering the surrounding rural space so that it furnishes *what the city demands*, *not what the land can support* lead instead to rural depopulation, depeasantisation and precarity (Smaje), both locally and (because of the global economy) globally. Here the city is a colonising power, rather than a contributor to a vibrant local economy.

Being able to identify healthy and unhealthy cities and support vibrant local economies will be important in our transition to new, climate supporting, trading systems.

Thinking Trap Four: We think that if we are good people, thinking carefully, we can apply the same code of ethics everywhere

As we grow up we are taught that certain behaviours are good and others not, and we tend to carry this distinction into the adult world of work as a uniform sense of work ethics. However sociologist Jane Jacobs observed that healthy societies require two distinctly different sets of behaviours depending on which of two roles we are engaged in. She called these 'commercial' and 'guardian' roles, both essential for society to function well but important to keep separate. If people mix the two sets of behaviour considerable damage ensues: Jacobs termed these mixtures 'monstrous hybrids. She gave two historic examples: the Mafia (a guardian organisation that has not abhorred commerce) and Nazi Germany's concentration camps (commercial innovation and enterprise but without the respect for strangers and aliens).

The terms are somewhat confusing, because 'commercial' roles include many that do not involve money, rather, a mindset in which we exchange ideas, resources, skills and services with people of many different sorts. Guardian roles are essential parts of the framework that ensures society can be well-governed, administered, and kept safe. Some behaviours are common to the two and these include courage, energy, competence, determination, common sense and patience, as well as the ability to behave responsibly and cooperatively. Other behaviours however fall into only one of the two behavioural syndromes (syndrome meaning 'things that run together').

In the commercial syndrome we applaud people who are inventive and enterprising, innovative, hardworking, competitive, interested in new technologies, honest, inclusive and as happy to enter into formal or informal contracts with strangers as friends, with neighbours and also people from around the world. We benefit from them being efficient and thrifty, and forward thinking - indeed

underpinning this set of behaviours and beliefs is often an optimism about being able to improve the future. Naturally we expect these behaviours in commercial companies, but we find them too in many other situations, for example health care and teaching, and running a child's birthday party!

By contrast it is important that guardians abhor trading. Loyalty is more important to them than honesty, indeed they may be *required* to lie (espionage, counterintelligence etc). They don't work readily with strangers, and can see the world in terms of 'them and us'. As their roles often involve personal risk they prefer tried and tested methods over 'new-fangled' ones. They take pride in courage, skills and effort, obedience and discipline, fortitude and stoicism, not so much in routine industriousness. Honour, face and reputation are all-important. Guardian roles often involve a level of ceremony and ostentation, think for example of courts and parliament buildings, as these convey a respect for authority. They are often fatalistic, this allowing them to say 'if the bullet has my name on it' or 'if I lose my seat at the next election' without that feeling disempowering. They do though treasure honour and face and will guard reputation over anything else.

In our day to day lives we move between these roles. As parents, teachers, friends, consumers and providers of all sorts of services, we will find ourselves in situations where we switch our ethical focus, for example do we buy the cheapest chicken or the one with the highest animal welfare standards? Sometimes we do so wisely, sometimes we have an underlying preference for one role and use it more widely than is helpful. It's important that people *can* and *do* move between these roles as we go about the different responsibilities in our lives, changing our behaviours as we do so. Failing to do so causes problems.

Jacobs published this work in the 1990s. What would she say today? I believe she would be horrified at the extent to which trading behaviours have been introduced into many guardian roles. She might also observe that we have not been acting as guardians of our planet. Many environmental issues require effective guardian behaviours, and we also need inventive, inclusive, dynamic 'commercial' behaviours if new ways of reducing material throughput are to be found. We need to be clear about what behaviours are ethical in what settings, and monitor them. Jacobs would certainly look askance at the revolving door between government office and roles in big business that is used by too many of today's politicians and senior civil servants. She would say, I think, this door needs careful guarding, or even boarding up.

We have already seen the devastating impact the fishing industry is having on our ocean-life. Let's explore this to see if Jacobs' theory helps us understand what is going wrong. What commercial and guardian roles are necessary for such an industry and its customers and the planet all to thrive?

An effective guardian role here must include designating the locations and boundaries of zones protected from fishing and policing them, defining allowable fishing methods, setting limits on the size of a catch, defining which species may be caught, humane methods of treating them, and limits and rules for bycatch. Different guardians must define and police employment practices and others will define trading standards for businesses buying the fish.

A valuable commercial role includes developing inventive new ways of spotting and catching fish, increasing the safety and conditions of their workers, efficient and effective methods for dealing safely and humanely with the catch, and for understanding and conforming with all rules and regulations.

In the observations that follow brackets indicate the roles played of guardians and commercial fishing fleets, G+ indicates a positive guardian role, G- an inadequate one, C+ commercial activities that benefit the fishing industry, C- those that contravene agreements.

There are protected zones (G+) but these are not big enough and not in enough of the most significant places (G-), the boundaries are rarely policed (G-). There are agreements about limits to the size of a catch (G+) but these too are not monitored (G-). There are also commitments about which species can be caught (G+) but when others are caught in the 'bycatch' they are still traded as food for fish farms (G-). There is rich use of tech wizardry to identify fish movements (C+) . The ships are fitted with state of the art catching and processing kit (C+). There is little policing of illegal methods (G-), nor of laws governing employment practices(G-). Many men on these fishing vessels are caught in contracts that are very low waged, high risk and involve lengthy periods at sea - way beyond civilised agreement (C-). Fish are traded as a (legally allowed) species when they are not (C-), fishmongers (C-) and port officials (G-) rarely enquiring, let alone confirming the answers. As a result towering ancient seascapes are bulldozed in seconds and the populations of haddock and halibut have been reduced by 99 and 98.5 % respectively. Inhumane, illegal fishing practices are left unchallenged (G-).
We can clearly see that the inhumane ghastliness of parts of this industry are due to insufficient guardian capacity allowing wilful violations by commercial players.

If the excesses of commercialism were rectified by increased Guardianship of the Oceans we would have sustainable fish stocks, humanely caught fish, intact seafloors, oceans with a plenitude of fish and other sea-life. Would that increase the price of fish in the shops? Yes. Would it reduce the amount of fish we ate? Yes, and as we do not need the amount of animal and fish protein we consume, this would not harm us and would leave the planet healthier. The current system benefits only the large commercial industries, the rest of us are simply pawns in their game.

Earth needs both guardian and commercial behaviours – but kept in strict balance. Guardians must set out priorities, rules, and boundaries. They must monitor these, police and guard them, seek out and penalise infringers. Thoughtful traders of many kinds must develop ways for addressing these priorities, efficient, effective, cost-effective solutions. To achieve this we will need to involve a much wider set of people as both guardians and as traders of ideas. We need people contributing knowledge and thoughts: historians, sociologists, all kinds of creative arts, as well as a much wider range of scientists, working with and learning from each other.

Thinking trap 5: We think putting a price on things we value will ensure they are protected

Surely putting a price on things makes people take them seriously, so how can this be a thinking trap? We could argue that a price *misrepresents* what it is that is being priced, whether that is a species of plant, an ancient forest, a river, a view, or the common lands traversed by indigenous people, and that these have an essence that cannot be captured in a price. But in practice, with no price on them, and no other protection they are vulnerable to people taking or destroying them for nothing. Surely pricing them constrains this?

What pricing does, though, is put them in the same conceptual category as anything else that has a price. A rich, fecund forest centuries old is measured in the same units as a newly produced machine: dollars, pounds or yen. Instead of protecting distinctive significant entities, a price strips them of their distinction and forces them to compete with anything else that can be bought or sold.

Where there are trades to be done then price is relevant. Something with its own standing, its own incomparable essence, cannot be allocated a price, there are no units of money that apply to it. Forcing a price upon it endangers rather than protects it.

If we are serious about protecting a wildlife habitat, a river, a mountain, common-lands, perhaps even a species, then we should think instead about granting them legal person-hood.

Three kinds of response to the unfolding crisis

Among the multitude of different proposals about how to tackle Earth's climate emergency, it can be hard to decide which are worthy of support and which are not. This is not a question of Goodies and Baddies but of different ways of looking at the world. People can be genuine in their belief that their proposals will be valuable and still be dangerous,

From my reading this year I suggest there are three different orientations or underlying beliefs that underpin most proposals. These reflect the primary focus or interest of the proposer: either the *economy* led by the market; or wider *society*, encompassing the economy but not limited to it; or our *planet* Earth as a whole.

There are of course others: those that deny that our climate is changing; those with a vested interest maintaining current patterns of consumption and waste; and those who are happy to leave the issue to governments and their advisors. Sadly, these may be in a majority. All the more important then that those of us trying to be part of a solution find ways of working with others who do too, even if their responses are different. We need to find ways of discussing thoughtfully with people who genuinely believe in different ways forward, and as we're only human this will involve preparation.

The three mindsets described below are indicative rather than definitive, and it is sometimes possible for people to hold one set of beliefs in one situation and another in another. They are offered in the belief that understanding other people's beliefs and assumptions is essential if fruitful dialogue is to take place.

Mindset 1: Market led approaches

Large companies are the only organisations that have the technical skills we need to tackle climate change and they can always buy in more if they are needed. They also have the expertise in managing largescale projects that the public sector doesn't have.

The climate crisis is too unpredictable for any form of centralised planning, we need to be able to respond to situations as they arise, rather than try to predict and control, so it's by focusing on the market economy that we can deliver the most significant outcomes.

Companies need to be given market incentives to decrease problem emissions and biodiversity loss. They may need help from government when it comes to things like zones for different land uses but otherwise government need only set the targets and incentives and keep out of the way. We've seen how effective these have been when it comes to green energy: the government has stimulated both its production and its markets – this is the future.

Keeping markets genuinely competitive and free of regulation is vital. This is what leads to the innovation and disruptive technologies that are the key to the future. Governments will never be nimble and imaginative enough to play a part in this, their role must be limited to protecting the market and to providing the small number of services that the market really cannot.

Economic growth is vital but can encompass all sorts of non-carbon or carbon-lite alternatives to current technologies. What we need is to find ways of de-materialising growth – so we can have growth that does not involve physical materials but still satisfies human needs. For example: you want a holiday exploring wildlife on the Masai Mara? – instead of flying you there we'll use fabulous three D immersive cinema to give you that experience.

Yes there will need to be additional requirements of business and it will be vital that these are properly monitored. For example:

• *A carbon tax* combined with proper monitoring of carbon use

• Monitored *targets for reductions in emissions*, leaving the precise methods up to the industries involved

• A *decrease in the concentration of some major industries* (food, as a prime example). Consolidation within industries has in some cases gone too far and created power imbalances, for example between

- corporations and governments
- corporate aims and the UN Sustainable Development Goals
- corporations and local indigenous populations
- corporations and carbon reduction targets.

It's these imbalances rather than the economic model that is causing the climate problems associated with industry.

• *Incentives and penalties relating to biodiversity*, clearly stated, effectively policed and implemented so companies can be confident their competitors are not gaming these.

• *Effective policing* of all relevant rules and regulations so companies can be sure others are not cheating and gaining a competitive advantage, this may be best done in conjunction with industry watch dogs as they know the scams and dodges

• Declared and monitored *standards for advertising* of goods to the public in relation to ecological features (carbon impact, biodiversity impact …)

There will be some understandable scepticism about allowing business to play such a leading role in these, as large corporations have been some of the biggest culprits in deforesting, over-fertilising, ignoring toxic waste, polluting rivers, etc. But since the 1980s corporations have been tasked with focusing only on shareholder value, if they are given statutory climate-related targets they will behave very differently.

On a very practical level, this is the only game in town: it has expertise and resources and huge influence with governments. Let's not waste resources fighting them, let's encourage them to play these essential roles. We (wider society and its leaders) need to get these big players genuinely on board, genuinely focusing on ways of addressing the climate and biodiversity crises. To do so we need to work with human nature and not against it, we must help them find roles they can play that allow them to be seen as corporate heroes. Demonizing them will be counter-productive, so we must be both warm hearted and also empathetic, cognisant of their most important goals and their constraints and devising significant (non-gameable) targets. This is a truly interesting challenge - far more so than merely condemning them as villains.

Mindset 2: Society led approaches

We are so much more than a market, than an economy – we're a society. We need governments to step up and play their proper role again.

Market economics has not so much met our needs as fuelled them, it's given us a set of ever more selfish, urgent desires that offer no lasting satisfaction, and have proved lethal for the planet. We know what it is that leads to people feeling fulfilled and it isn't incessant consumerism, it is

relationships, a balance between work and leisure, a sense of security and of fairness, of achievement. Only if governments play an active role can those be delivered: a role shaping the business environment, offering high quality universal services, caring about unemployment figures and the kinds of jobs on offer, and sharing a sense of responsibility for our wellbeing.

We need markets but only where they allow us to meet our requirements as a society better than the alternatives. Governments now need to care directly about the wellbeing of society as well as the economy, and be prepared to teach us the difference between them. Currently big business is sponsoring a frenetic, planet-threatening consumerism that makes sure we are constantly unsatisfied. Only Governments can challenge that effectively.

Since the 1980s economic growth has been recognised as essential, so what we need to do is find ways of delivering growth without consuming more energy. This is completely unprecedented but we are making such good progress with green energy that we can be hopeful. It will, though, need new technologies rooted in new research - research on a scale that only governments can support. After all It was the American DARPA programme of the 1960s onwards, led and funded by the US government, that gave us the technology for our digital age. Without that government funded research today's tech billionaires would be nowhere.

As we begin to understand that over the last century we've certainly reduced the amount of our own energy that is put into daily tasks and our material possessions (but only at the expense of the environment) we will grasp the scale of the problem and welcome back governmental input. This is such a radical change from today's deeply held assumptions that we will not find this transition easy.

We will need a multi-pronged approach that includes:
• 'greening' and 'rewilding' where we can
• regulating and policing (e.g. setting limits on the use of nitrogen-based fertilizers, policing any run-off into rivers and streams)
• bringing back into public ownership vital functions such as the treatment of sewage, so there is no commercial incentive to ruin such vital natural resources as rivers, streams and aquifers
• encouraging changes in diet (reducing meat and dairy)
• a national school curriculum that includes skills our society needs us to have, Including subjects we have dismissed from school curricula over the last half century, such as cookery and nutrition, along with handiwork of many kinds to allow repairing and recycling to become the norm
• perhaps, consumption targets, limits for the use of virgin materials, an 'Earth bank account' with its own bank-card, allowing us to use only as much Earth produce as we return.

But alongside this comfortably folksy picture we will need major technological solutions. We will need to extract carbon from our atmosphere by changing from carbon sources of energy to those of wind, sun, and probably nuclear power. We need to bring together experts in all relevant sciences and technologies and agree a roadmap for the planet: a set of agreements about sources and quantities of energy to be developed, available and used by every country.

Population growth will also need to be tackled. The population growth of the global south is higher than that of the global north, but education for girls will play a major role in reducing that to parity within decades if we ensure it is properly funded.

Currently citizens of the Global North consume much more energy per capita than those in the Global South and we cannot expect the latter to be constrained to permanently lower energy use. The issue is not only a moral one but the practical one of avoiding international tensions leading to war. Western societies will therefore have to lead the way in reducing their use of carbon, and,

crucially, stop exporting their destructive impact on biodiversity to the countries supplying them with their foodstuffs and other consumer goods. This is likely to require a reinvigorated United Nations given greater powers to contend with global corporates.

If we are to have truly sustainable development we will need to bring people together around the world, we cannot leave it to the vagaries of economic markets, we need clearly thought-through strategies based on the best science and on principles of justice, to which we can gain international agreement and action. Together we can do this.

Mindset 3: Planet led approaches

Can we fix this? Can *we* fix this? Is it really plausible that one single species of the billions on Earth has the ability to govern the highly complex system from which they evolved?

Oh we're clever. But we're not omnipotent. Other species have abilities and perceptions completely beyond us. Let's remind ourselves that a dung beetle navigates using the Milky Way and a dragon fly can see 30 times more light waves than we can and perceives the world in ways we can simply cannot imagine (Tong). Our understanding is limited and knowing our limitations will be vital.

And what makes us think that today's technology and science will be effective? 2-300 years ago, we had no conception of bacteria, of cells, of the periodic table, of Einstein's insights. What do *we* not know that our successors 200 years from now will take for granted? How can we possibly believe we can control a living planet we barely understand?

Just think: A vibrant, ancient forest alive with an abundance of animals and plants, microbes and more is easy to destroy – not nearly so quick and easy to recreate. How would we set about generating a living system of interacting plants, animals, soils, microbes, and all sorts of local species we've never seen or named let alone understood? We can install something that looks a bit like it, that will be fine for walkers and sightseers, but not the living, self-organising, teeming, regenerating, species evolving, life sustaining, forest we've destroyed. Not the home and sustenance of all the myriad of species here: each special, with very different ways of enjoying the world from ours, with senses we don't have, awarenesses we can't imagine, inter-relationships we haven't imagined, let alone understood. Rewilding can be very successful, but is a natural process that takes a lot longer than the despoiling.

How dare we presume to imagine a planet designed and run by us? We're acting as though we are not only superior to every other species but have the right to dominate them and determine their destinies. As though they aren't all a part of the ever-evolving natural ecology on which we depend, indeed of which we are a part. Our only chance of any kind of life worth living is to let Nature run the show, the Planet. To give her the space to do that. And that means us occupying less space ourselves. Much less. Not by moving to high-rise, high-density cities, there still wouldn't be enough room on the planet for our food industry, one of the biggest destroyers of natural habitat. Even with the kind of high intensity, heart-stoppingly cruel factory farming methods used today (see for example, Eating Animals, by Jonathan Safran Foer) the Earth just does not have the capacity to feed all of us AND the natural world that a living planet needs.

We've been proud of our human ingenuity and believed we could thereby exempt ourselves from basic laws of science. Some economists have even claimed that nature's 'carrying capacities' do not apply to us. We genuinely did not realise that our cleverness was in finding different forms of theft: mainly stealing the lives and habitats of so many other species. Think of the soil for example, how we've stolen it, by using nitrogen fertilizers, from the rich array of microbes that regularly recharged it after every harvest.

We have to work within the Earth's limits: limits for *us* that allow other species to flourish. We have to reduce our human population to within those limits by globally reducing our birth rate. Over the next century (4 generations), through education and support for women, we can come easily and naturally to a truly sustainable global population (probably about 3 billion). The result will be a very different way of life for us all.

Research and innovation will still be important - but not in pursuit of larger populations or 'economic growth'. It will focus on ways of allowing us all to flourish within those natural limits. Indeed we will look at all sorts of numbers very differently. We'll learn to include in our gaze all aspects of life on Earth, including those that are unquantifiable, and resist the temptation to attach financial or other instrumental values to them. Terms like Return on Investment, for example, will have a different meaning: a wide consideration of how the Earth will benefit from an activity we are considering. Any discussion about Global Trade will include who and what is benefitting from these trade flows and how. Anything reduced to numbers on a chart or a curve on a graph will be known to be overly simplistic. Any proposals for projects such as hydro-electric dams, nuclear power stations, and high-speed rail will be considered by exploring all their impacts, both qualitative and quantitative.

Treading as lightly as we can on the Earth will involve a huge shift in our implicit attitudes to many things we take for granted; like waste. We'll need to relearn how to relish what we have, plan carefully for what we need, what we will dispose of (and how), repair and repurpose what we can, and take purchasing new items seriously and with ceremony.

How do we achieve all this? Not by devising a strategic master plan and a cascade of work programmes, ticking items off as we complete them. We need to truly understand that complex uncertain situations need ongoing tentative steps (forward, sideways and back) constantly reviewed and adapted. We'll also need to discover that our current unidisciplinary ways of understanding the world in separate subject areas don't allow us to see the whole picture. After all nature doesn't organise herself in terms of different knowledge bases and nor should we. Neither is she a series of linear puzzles for us to solve. So we need to combine insights from a wide range of sciences and humanities and explore them through a lens of a good understanding of complexity, chaos and emergence.

Of course we'll need to be wary of predators aiming to thwart or subvert such a transition, especially those with a significant profit motive. This will not be easy and as the planet becomes less and less habitable tensions will grow. But this is the only way of achieving a genuine balance in which both humans and the planet can thrive, and this may become more and more apparent to more and more people - hopefully in time for such a reversal of direction to be possible.

Exactly what this will look like we can't know and this is scary. Yet if we understand that our knowledge is limited and that Earth is more amazing than we have the senses to be able to imagine, we will move, forward thoughtfully, with care and caution and great concern for all the occupants of our planet.

Using these three mindsets

We can see in our daily news feeds that there are people from each of these mindsets who are genuinely trying hard to address our climate crisis. How do we choose between their proposals? Can I suggest that this is where a knowledge of the six fundamental causes can help? Which of the six is this particular proposal addressing and how? All of them? Are some addressed while others are not

harmed? We might want to support these. If some are privileged at the *expense* of others we must surely rule them out.

People in Mindset 1 often do not accept human supremacy as a problem, nor capitalist economics, and they have usually failed to recognise the plenum of life as crucial. Their focus is mostly on the reduction of carbon emissions through the market system. Fundamentally they can believe that humans, aided by the magic of the capitalist system are so ingenious they can find ways of transcending the laws of physics: not because they are stupid or wicked but because their implicit belief in human reasoning is so extreme, and they see the world as a set of isolated puzzles rather than a complex 'mess'.

Nearly all of their big-tech solutions require human annexation of yet more land and more of nature's plenum: for carbon capture storage, for wind and water power construction, for the mines extracting the large quantities of the rare earths needed, and more. Each problem is treated as an isolated one, with an individual technofix offered for individual problems (often increasing a problem elsewhere). In such a world private corporations will be powerful because their expertise and R and D will be indispensable. It's likely though that none of the solutions address five of the six fundamental causes, only provision of alternative energy and perhaps alternative uses of waste, and even that only in a way that is unsustainable.

Mindset 1 people tend to believe in the fundamental selfishness of humans and that this is a powerful generator of a better world. Many of them believe that a 'rising tide raises all boats' and that economic growth is good for everyone despite all the historical evidence to the contrary, or rather: by carefully choosing the history to consider. They tend to see inequalities as deserved or as involving luck, not that they result from the economic system they support. They are often powerful and have the ear of government and intergovernmental decision makers.

We must not alienate them. We want to help them use their power, influence, energy and resources in healthy directions and we'll encourage that by understanding their priorities and constraints. We're more likely to meet less powerful adherents of these beliefs in our families and neighbourhoods, and when we do it's helpful to see them not as enemies but as not having had the time and energy to grasp more of the whole complex picture. We need to help them see the crisis in terms wider than only emissions. Introducing ideas of human supremacy and the role of capitalist economics will almost undoubtedly be a step too far. Engaging their interest in causes 1-3 (soil, population; energy/waste) will be easiest, but somehow we must help them to come to care for the plenum of life or their responses to 1-3 will jeopardise it further. Given their standing in society we must seek to widen their horizons rather than alienate them.

People in Mindset 2 are more awake to causes 1- 4 (soil, population, energy/ waste, the plenum) than are those in mindset 1, and to the inequalities that contribute to the dangers. They are no less challenging, though, of human supremacy, and indeed have confidence in government led action to make a significant difference. They also have a greater concern for fairer societies and we could perhaps encourage that sense of fairness to extend further: to a fairer plenum and planet.

They often voice a concern for 'being realistic' which can infuriate campaigners who know that maintaining the status quo is not at all realistic either. However this is often about convincing others – they know they can do nothing on their own. Whether they are politicians seeking votes, company directors the support of Boards, individuals wanting to fit in, it is highly uncomfortable (and sometimes ineffective) being an outlier. Citizens Assemblies are often proposed and run by Mindset 2 people (and come up with Mindset 2 solutions).

We can support Mindset 2 people by giving them stories they can tell, stories that challenge and overcome the selfish myth, the 'greed is good' lie. Here we may be able to draw pictures of a different kind of society (different kinds?). For example, we may be able to:

- introduce them to the pain of the plenum, the tortures of the food industry, the damage of global trade infrastructure and invite them to care about these
- gently challenge them when their solutions invoke further harm
- help them to see that it is completely possible to have competitive markets without capitalism and that indeed these look much like the markets they may have experienced 50 years ago. (Hickel).

Mindset 3 is a completely different paradigm. In general people in mindsets 1 and 2 understand each other even if they disagree. They tend to see climate change as a phenomenon in its own right, biodiversity as an optional extra, a healthy plenum as a 'nice to have'. They can imagine a world of largescale engineering projects producing renewable energy on the scale needed. They have generally given little thought to what this means for other species and whether this will lead to mass extinctions. For people in mindset 3 occupying such a planet would be intolerable: 'a planet destitute of biodiversity and awash in constructed environments, domestic animals, croplands, and generalist species, with scattered relics of wild areas here and there' (Crist).

Mindset 3 requires a *paradigm shift*: Thomas Kuhn's term describing a time or situation when the usual and accepted way of seeing and understanding something changes completely, so completely that we cannot think ourselves back into older ways of seeing it.

Moving from mindset 1 to 2 is a change in focus. Its big. It's helpful. Moving to 3 is HUGE. We have centuries of history of plundering the plenum and, now we can no longer do that and need instead to treasure it, we may need to become a different kind of human. This may be too big to happen all at once. It may be crippling: 'who are we to even try to tackle these problems….'. Mindset 3 however is what we and our planet need and with time it settles into a purposeful humility and a strong desire to find ways to address the six fundamental causes. It can involve feeling helpless: overcome by impotence and grief, sorrow for the amazing natural world we have almost exterminated and fear for future generations of our own families. Anger and even hate for those continuing that extinction process are often not far behind, especially as we begin to see the violence and tyranny that we've already imposed upon the natural world being imposed on humans fleeing the disruptive consequences of a warming planet. We need to find ways of directing the energy from this anger, and of engaging fruitfully with people and arguments from mindsets 1 and 2.

These three mindsets are, of course, not the only ones held among our populations, even among those truly concerned about the climate crisis. In particular there are many who are choosing to focus on efforts they can make themselves. We could call them energy individualists and I've represented the views of an ardent individualist in the box below. On its own this will not be enough and its proponents can valuably become involved in the wider debate and not avoid it. Similarly people looking at the bigger picture will be taken more seriously if they are taking responsibility for their personal energy use.

Energy individualist mindset: *I don't and won't drive – I cycle everywhere local and take public transport for longer journeys. I've insulated my house, have a heat exchange pump, triple glazed windows, a wildlife friendly eco-garden, grow as much of my own food as I can. I re-use as many resources as I can. I make sure my clothing is ethically sourced and uses only fabrics that are recyclable. I only buy clothes second hand or from charity shops. I have a compost heap for food rubbish and recycle everything - I try to do that myself so that I am sure it IS recycled. I use only rainwater and waste household water on the garden. I buy food from sustainable sources, I'm mostly vegan with occasional dairy products.*

Wherever I can choose an ecofriendly option I will take that choice. If we all did this the planet would be in a lot less danger than it is. I'm not very concerned with wider issues, once I realised many years ago that the planet was in peril I have done everything I can at a personal level to make a difference. That's where I'm most effective.

Along the way we'll meet others too, the deniers, the '*got better things to do*'ers, the '*it'll all be alright*'ers and we must choose carefully where we invest our personal persuasive energy.

Using this paper

It was because I had no means of evaluating proposed ways forward that I set off on this reading adventure. I chose the structure for this essay so that I could use it to inform my own reactions, and if you have got this far perhaps you may find it helpful in informing yours.

When coming across proposals for action we can:

- check any proposals against the list of *fundamental causes*, do they address all of them? Only some of them but without harming others? Do they cause further harm in any of the six? This will indicate which proposals we need to oppose. Naturally we will need to oppose them as gracefully, convincingly, encouragingly, firmly and effectively as we can.
- check for any use of the *thinking traps* and again oppose any proposals based on these, ideally helping people understand the trap itself
- check proposals against the *three mindsets*: Which mindset is this proposal coming from? How does that influence further activity? What happens next? How can we respond without alienating nor endorsing? If we are to act with the wisdom and speed required we will need to act ourselves from mindset 3 but engage (awarely) with people from all three mindsets.

Where are we going? What is the future we are aiming for?

That is the trouble, we don't know, we can't know. There are exciting, enabling futures possible, and terrifying ones, and everything in between. It may be that the affluent and exploitative global north will continue to behave irresponsibly, secure in the knowledge that it is in the global south that the problems will be felt most acutely, problems such as rising seas, rising temperatures, increasing desertification and the political unrest that accompanies those. If so, wealthy countries may defend and protect their lifestyles, erecting ever more physical barriers to those fleeing their home countries as they become overwhelmed in these ways. We already see the seeds of this in the reaction to migrant boats in the Mediterranean and English Channel.

We could choose instead to dismantle our global supply chains that cause so much harm to both nature and to humans, developing local economies rooted in local food production. A change of this sort would be momentous but may take more determination than time. After all it has taken only 60 years to build the current global food system, around mega-sized, soil-depleting, nature-hating farms. Indeed the last 20 have been the most destructive, and with focused effort that could be reversed in an even shorter time. If Chris Smaje can imagine small farms renewably skimming beautiful landscapes, leaving space for other people and other creatures then perhaps we all can.

Manufacturing, too, could look very different: taking place much more locally and in smaller volumes as we reduce significantly the quantity of new goods we purchase. Engineering and innovation skills could be retargeted to inform methods for repairing, repurposing and recycling, not just at the margins of our economies but at their centre.

If we started along this path we would begin to challenge things we currently take for granted. Let's think of cars for a minute. The average small car weighs twelve times as much as the average European adult, a small SUV (bought almost exclusively by city dwellers not country folk) twenty-four times. Before long we could see it as laughably absurd to demand supplies of energy that big to simply move us from A to B. There are already prototypes of tiny ultra-lightweight cars with batteries rechargeable at home in a couple of hours. These could revolutionise town and city transport, sharing road space with cycles and electric scooters, leaving safe space for walkers and linking with punctual and efficient public transport for a wide range of types of journey. What feels impossible now may suddenly feel obvious as we start to take this seriously.

With burgeoning 'repair and repurpose' clubs, perhaps 'Earth-cards' requiring that we purchase no more of nature's materials than we surrender, and fashionistas helping us choose garments that flatter us so well that we are happy with microscopic wardrobes, we may find new lifestyles that are not only more sustainable but more enjoyable than those we are living now. We may develop all sorts of skills we currently have no time to use: in making, tending, and creating; in physical sports; in maintaining real relationships in place of virtual ones. The result would be economies and lives that look different from today's: a much shorter working week (perhaps even the 15 hours that Keynes envisaged a hundred years ago), more meaningful and varied hobbies, more time for caring roles, different means of transport, different forms of entertainment, and kinds of housing. Our commercial companies would be different too: no private sector monopolies only genuine competition, with much shorter periods for Intellectual Property Rights. Economies may not grow but could still offer us the choice of goods that we need and want (and we may talk again of societies rather than economies.) Our lives could be different but just as rich.

This may be a pipe dream. *We're only human* after all and many of the 'haves' will not want to give up their privileges no matter how unsustainable they are. We can't guarantee that these processes will yield the results we envisage in the timeframes that allow people to keep faith in them: barriers and barbarism and war may erupt. *But if we decide that putting up barricades to keep out desperate migrants from the global south is inhumane and unsustainable we are going to have to re-imagine our world. And in that case it would be a good idea to start doing so soon, while we still remember what civil relations look like in open societies. We can use our current ways of life as a picture that informs us, and gradually lose our expectation that it is something we can demand.*

Choices we make now will influence whether we have a future of hunkering down to defensive animosity and warfare or are open to more humane and enjoyable alternatives. *Exactly* how we do the latter we can't yet know, we have to find out by experimenting with initiatives like those mentioned above, and learning as we go. A single master plan isn't the answer. Instead, multiple experiments and initiatives in tune with overarching aims will be necessary.

We may well choose to remain on our current path, triggering ever greater inequality, more assets to protect, more disorder, violence, more and more desperation, more distance between 'them' and 'us', more deployment of face recognition tech… Unless we actively stand against this it could very easily go this way. But we *are* human, we do care about others: other people, other species, and, crucially, other generations. We may need to keep reminding ourselves and others of what humane responses look like, but we *are* capable of that.

Just as our parents or grandparents in the 1950s and 60s were proud to be part of the amazing scientific progress of that time, so, now, we need to be prepared to rethink old certainties and think new thoughts and give our children and grandchildren the chance of a life in a non-turbulent, non-frightening world.

No, it's not realistic

As we interact with all the kinds of people and arguments discussed here we will often come across the word 'realistic', and especially the phrase 'it's not realistic'. Those saying it loudest and most vehemently are likely to be those with the most to protect, but anyone saying it will be right. Nothing that is a big enough change to have a chance of succeeding in addressing the six fundamental issues described in the first section will be realistic. It is not realistic, for example, to expect a complete change in the way national leaders and those leading intergovernmental organisations see the world. It is not realistic to expect people to be able to imagine the kind of life that uses hugely less energy. It's just not any less realistic than maintaining the status quo which will assuredly lead to the displacement and deaths of millions, and a completely unpredictable precarious life for our grandchildren.

There are no 'realistic' options.

Accepting that is both terrifying and liberating. It is what gives us permission to think and act differently and indeed requires that we do.

Valerie Iles
July 2021

Appendix: Texts from which these arguments are drawn

1. The changing face of mainstream economics;
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2. Abundant Earth: toward an ecological civilization
Eileen **Crist** University of Chicago press 2019

3. Unlearning human-centrism: A bumpy road
Louise **Grancitelli**, Jonas Himpens, Anne Snick The Ecological Citizen Vol 4 No 1 2020

4. What does degrowth mean: a few points of clarification
Jason **Hickel** Globalizations 2020

Less is More: How degrowth will save the world
Jason **Hickel** Windmill Books 2021

5. Good times bad Times: The Welfare Myth of Them and Us
John **Hills** Bristol University Press 2017

6. The Post Growth Challenge: secular Stagnation, Inequality and the Limits to Growth
Tim **Jackson** CUSP 2018

7. The Deficit Myth: modern monetary theory and how to build a better economy.
Stephanie **Kelton** John Murray 2020

8. A Buddhist History of the West: studies in lack
David **Loy** State University of New York Press 2002

9. The Great Transformation. The political and economic origins of our time

Karl **Polanyi** 1944

10. To prepare climate strikers for the future, we need to rewrite the history books
Amanda **Power** The Conversation 25/1/2020

11. Entropy, the anthroposphere and the ecology of civilisation
Stephen **Quilley** The Sociological Review 2011

12. Aid on the Edge of Chaos: rethinking international cooperation in a complex world
Ben **Ramalingam** Oxford University Press 2013

13. Bildung in the 21st Century – why sustainable prosperity depends upon reimagining education
Jonathan **Rowson** CUSP June 2019

14. The Finance Curse. How Global Finance is Making Us All Poorer
Nicholas **Shaxson** Bodley Head 2018

15. A Small Farm Future: Making the Case for a Society Built Around Local Economies, Self-Provisioning, Agricultural Diversity, and a Shared Earth
Chris **Smaje** October 2020

16. Wiser than Vikings? Redefining sustainability in the Anthropocene
Anne **Snick** ResearchGate April 2020

17. The Reality Bubble: Blind spots, hidden truths and the dangerous illusions that shape our world
Ziya **Tong** Canongate Books January 2020

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Isabella **Tree** Picador May 2018

19. The Morals of the Market: Human Rights and the Rise of Neoliberalism
Jessica **Whyte** Verso November 2019

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War on Want :https://waronwant.org/news-analysis/what-is-ttip

21. The way we eat now: Strategies for eating in a world of change
Bee **Wilson** Harper Collins March 2019

22. The Hidden Life of Trees
Peter **Wohlleben** Willian Collins August 2017

23. *Unsustainable Fishing : Our Oceans being plundered*
***W*orld Wildlife Fund**

Worth also looking at the *General situation of world fish stocks*
United Nations Food and Agriculture Organisation