

STORIES OF THE FUTURE

Peter Harper

Introduction

This lecture is about how we, as individuals or communities, make sense of the information we collate throughout our lives. It is about narratives, or stories, that we use to help us construct ‘reality’. The article is designed to make you think more subtly about the way in which we perceive and analyse data. It uses parables and anecdotes to illustrate the point.

Rapidly changing events have rendered some parts of this essay out of date, but *that too is part of ‘the story’.*

Figure 1: The Necker cube

Figure 1

Figure 1 shows the celebrated visual illusion called the Necker Cube. It is just an arrangement of lines on a flat surface. Nevertheless the human brain cannot resist interpreting it as a solid object.

This is a simple example of the human proclivity to impart ‘meaning’ to observations that might have no intrinsic meaning or pattern at all. When it comes to events in time, we do something similar, but in the form of what we might call ‘story-lines’. A story imparts meaning to a possibly random pattern of events, helps us remember details, gives a concise summary to tell other people, and suggests ways to act on them. A ‘story’ in this sense might be quite simple, as with a basic metaphor (like “the population explosion”), or it might be longer, but always with a vivid central pattern. Other terms used (mostly by social scientists to sound more formal) are: myths, paradigms, narratives, discourses, frames.

The Necker cube has another interesting property: there are two ways in which it can be made sense of as a solid object. If you look at the ‘cube’ for a while you will find that your brain switches spontaneously from one meaningful interpretation to the other, and back again. It is digital process, one or the other. There is no half-way house, although with a supreme effort you can fleetingly view the figure for what it ‘really’ is, a pattern of lines on a flat surface.

As with the Necker cube, there are often several different story-patterns that can be imposed on a given set of events or observations, yet in practice it is difficult to follow several stories at once, or mix the stories up. On the other hand, unlike the Necker cube, with events in time we do not readily switch from one interpretation to another. Most ‘facts’ already come embedded in a story, and we usually stick with that interpretation. In fact habitual familiarity with a particular story-line can make it seem the only possible way of looking at things and become extraordinarily resistant to change. From time to time we will encounter other people who have a completely different way of understanding certain things. It can be disorienting, even shocking. But this reminds us that there is very rarely only one way of looking at things.

I shall be contrasting two very basic storylines which have been used to make sense of reported events in history, contemporary life, and speculations about the future. One story is to interpret events as a cumulative sequence, evolving, improving and pointing over the horizon to an indefinitely wonderful future, perhaps with a few wobbles on the way for dramatic interest. The other story is one of decline from elevated beginnings, through a series of tragic mistakes and misguided actions to a state of total collapse which nevertheless often hints at some purifying redemption. They can both be compelling accounts, ripping yarns as it were, but they do not easily mix.

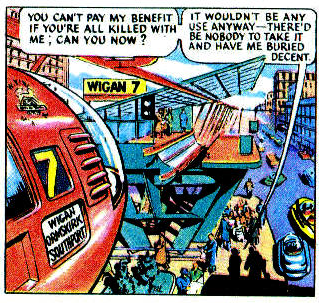
When I was younger, comics gloried in images of a ‘techie’ future. The classic case was the Dan Dare comic strip in the *Eagle*, (Hampson, 1950). The gifted illustrator Frank Hampson created an attractive cast of characters and vast stories that, in weekly instalments, took years to tell. He imagined that by the late 1990s the earth would be at peace under a world government, and the UN Spacefleet (based, handily, in London) would be exploring the inner planets, with numerous space stations and a flourishing colony on Mars. Cities had a quality that even now we tend to call ‘futuristic’, with large, smooth, geometrical structures and largely airborne local transport Certainly the Wigan to Southport bus did not have wheels!

Figure 2

Half a century later we know that things have not changed so quickly, but do we still have the same vision of the future? Is it just that all this will happen later? Or do we have other visions?

In classical times in Europe, there was little sense of progress towards better things. In fact the opposite was the case. The Biblical notion of the “Fall” created a basic narrative of decline from a formerly exalted condition. They spoke of a ‘golden age’ in the past, lapsing into a ‘silver’ age and then into brass, iron and finally the dissolution of civilisation. In some ways this is not surprising; in Christian theology human life on earth was simply a brief prelude to everlasting life-after-death, so it did not really make sense to improve things materially here on earth; you just needed to keep your nose clean for a better deal in the hereafter.

Nevertheless things *did* improve materially. After the so-called Dark Ages, new ideas and new technologies gradually raised the standard of living. By the fourteenth century a new ‘humanist’ temperament was emerging, that wanted to celebrate and improve human life on earth. The earth itself was explored, new knowledge sought and shared, and the idea began to take root that, materially anyway, things really could get much better. There were Utopian fantasies of ideal societies, and tracts extolling the virtues of empirical science and technology. By the time of the ‘Enlightenment’ in the 17th century it was obvious that ideas we would now call ‘scientific’, and their application in new technologies, were capable of causing major changes, generally for the better. It was not received religious ideas that were setting the agenda, as they had in medieval Europe, but reason and empirical discovery. This led to a decline in religious faith, and to an underlying narrative that we might call ‘progressivism’ – the idea that general improvements in society are possible, desirable, and to be expected. This basic pattern of thought continued to ‘gather steam’ (generating new technological metaphors on the way, like that one) throughout the 18th, 19th and 20th centuries. We inherit this basic pattern of thought.

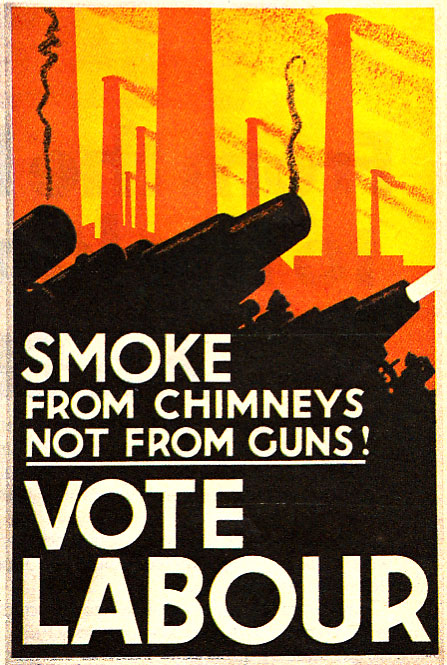
Of course it wasn’t all plain sailing. Especially during the early industrial period there were tremendous disruptions and localised hardships and tragedies. There were critics and pessimists like Ruskin, Tolstoy, Morris, Spengler. But these voices were rather like recessive genes: their power was merely potential, always in the background. The progressive view has remained dominant. Significantly this has been true right across the conventional political spectrum. On the right, capitalism realised that constant innovation and change were essential. On the left, both Marxists and social democrats maintained a vigorous faith in science and technology to deliver their dreams of a better society. Lenin famously defined communism as ‘Socialism plus rural electrification’.

The connection of science and technology with progress has become even stronger, and it is this that led to the ‘futuristic’ imagery of mechanical, geometrical, hygienic, highly controlled and orderly future societies.

This brings us to about 1950. Two awful world wars had rocked our confidence a bit, but the ‘evident’ triumph of good over evil in WWII and the tremendous surge of new technology it had generated, gave rise to a period of almost unrestrained optimism. Even the ‘bad’ applications of technology could be turned to good: explosives technology becomes cheap chemical fertilisers; chemical weapons technology becomes ‘magic bullet’ pesticides; nuclear weapons technology is tamed to generate electricity. Of course many modern readers will register sinister undercurrents in the last sentence, and that is part of the story I am telling, but in the immediate postwar world there were few doubts. ‘Swords into ploughshares’ (Isaiah 2:4) is itself a stirring story, and that’s the way it seemed at the time.



It is in this period―the second half of the 20th century―that ‘modernity’ as it is commonly called, really gets into its stride. Europe, North America, the Soviet Union and Japan experience rapid economic growth, and the progressive view expected the same conditions to spread elsewhere. There is only one broad track of economic evolution, ‘one best technology’ and the only question is where you are on that track.

The big divide in this era appeared to be between the capitalist west and the communist east—the Soviet Union and its satellites, and China. It was a genuine question to which nobody could give a definitive answer: would market-based systems or central planning give better results? An American visitor to Russia in the 1920s reported, “I have seen the future, and it works”. Nikita Krushchev, the Soviet leader in the 50s, famously boasted to the USA, ‘we will bury you’ (he meant economically-speaking, and he was widely believed). As a politically-interested teenager in the sixties I was myself well aware that the issue had not been resolved.

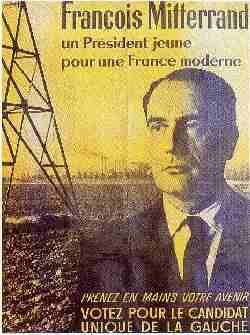
Whatever their differences, both sides had progressivist ideologies, with total faith in the power of science and technology to deliver the goods. It was amazing to see how the Russians in particular, appeared to take great delight in trashing their ancient heritage in favour of what now looks like a really sorry version of the ‘futurist’ vision, with grim concrete barrack-like buildings, sterilised mechanised farms, and highly regimented social forms. They really believed that the future was ‘scientific socialism’, and science was often taken to imply a kind of aesthetic nihilism. I dare say something similar is going on now in many parts of China.

Figure 3

But of course people who are materially deprived have a completely different perception of ‘the environment’ than affluent consumers. In fact it often worked in reverse, where environmental damage was regarded with pride and affection as a *sign of progress.* See for example the poster proclaiming that ‘Chimney Smoke is the Breath of Soviet Russia’, or the Labour Party poster from 1935. Even as late is the seventies, imagery of the infrastructure of modernisation could be used in a positive light to promote a presidential candidate in France, and even a pylon.

This would be unthinkable today, but likewise our rather mincing ‘post-modern’ attitudes would have seemed bizarre to British people even in the early 20th century, and to most other people even now.

Visions of ‘the futurist city’ have a long connection with totalitarianism. The totalitarian idea, that people exist for the state rather than the other way round, and that absolute order and control is a worthy aim, is given a remarkable treatment in Frank Hampson’s very first ‘Dan Dare’ story in 1950. In this story the earth of the 1990s—considered at that time to be unimaginably far into the future—is well-organised and at peace, but short of food. It is decided to send a mission to the unknown planet Venus, to see whether surplus food could be obtained there. To the astonishment of the explorers, two quite distinct cultures are discovered on Venus, separated by an impenetrable ‘flame belt’ that surrounds the Venusian equator. Both cultures are extremely advanced in technological terms, but have dealt with the ethical issues of science and technology in opposite ways.

In the south are the *Therons*, who have decide that technology must remain the servant of higher human values. They have not abandoned technology, but sequestered it in totally robotised cities and farms that produce the necessary goods for a comfortable standard of living. The Therons themselves live in relatively simple rural homes, to which goods are delivered by robotic transit systems. This frees them to concentrate on what they consider important: family, relationships, the arts and pure sciences, philosophy and contemplation.

In the north, in complete contrast, are the *Treens*, for whom science and technology have become ends in themselves. They appear to have lost all humane values, and strive only to increase their knowledge and power. Their genetically-modified leader, the Mekon, most of whose body consists of a giant head housing a colossal brain, becomes the arch-foe of Dan Dare and his earth comrades, who counter his enormous machine-like intelligence with a strange amalgam of military and Christian ethics plus guile, humour, solidarity, and up-an’-at-‘em pugnacity.

These great comic-magazine allegories reflect a recurrent theme in late 20th century social commentary. Has science and technology gone too far? Are they forces that we can really control? Or are they destined to control *us*? Should we at some point draw a line in the sand and say, ‘this far, and no further’? Can we at any point exert our reason and morality to decide how science and technology should be used? Or one day, could it be too late? To inject a personal note, I am sure that these tales had a strongly formative effect on my ethical and political views, and those of many of my contemporaries.

In subsequent decades these questions would be raised in many different ways. One of the first groups dissenting from the prevailing gung-ho techie programme was the ‘organic farming’ movement, emphasising the complexity of ecological relationships and the need to keep returning organic matter to the soil, both for its own health and for the quality of food grown on it. This movement was derided as based on ‘muck and magic’, i.e., on outmoded mystical ideas that had been superseded by the crystalline new scientific approach. Muck―i.e., filthy, complex, uncontrolled, unanalysable organic crud―was emblematic of what would be replaced by the scientifically precise chemical N:P:K out of a clean bag, spread with impressive precision from the back of a tractor. Chemical fertilisers were cheap and gave evident results in terms of increased yields. What more could one ask for? These days organic farming is better respected and growing fast, but it is still hated in mainstream farming, at least partly because it represents a completely different conception about how things work, and how they *should* work.

Another thing that started happening in the 1950s was upsurge of worries about population growth. This was essentially a rediscovery of the ideas attributed to the 18th century economist Thomas Malthus (Malthus, 1798), who argued that populations tended to grow exponentially if they were able (growing by compound interest), whereas improvements in agricultural productivity were only arithmetical (growing by a fixed proportion in a given period of time). Therefore, unless certain positive policies were followed, the default process would lead to overpopulation and starvation.

This was an early example of what we might call ’ecological historicism’ in which physical trends are extrapolated into the future and shown to be, in modern parlance, unsustainable. In the event, Malthus’ fears for Britain were not borne out, since agricultural productivity did almost manage to keep up, and the British Empire provided both extra food and outlets for ‘surplus’ population. We will see more examples of ‘ecological historicism’ later:

In the 1950s however, the ‘neo-Malthusians’ noted that on a world scale, there is no ‘empire’ either to absorb people or provide extra food. They looked at trends in world population and predicted alarming potential effects in a surprisingly short time. In the sixties I remember reading a book with the shockingly frank title *Famine 1975!* (Paddock and Paddock, 1968).

There was no famine in 1975. But the neo-Malthusians obviously had a case, based on the brutal logic of exponential growth. Until about 1965, world population *was* growing exponentially. It was doubling about every 25 years. Therefore by 1990 it should have been 6 billion (actual 5.2B), by 2015, 12 billion and by 2040, 24 billion. These were ‘default projections’ from existing trends, and they did signal unsustainable, or at least very problematic, futures. The actual out-turn has not been so high, and the UN expects world population to peak at around 9 billion during this century (Lutz et al 20040) To see live population figures <http://www.worldometers.info/population/>

Box 1

WORLD POPULATION MILESTONES

UN Population Division

World Population reached:

1 billion in 1804

2 billion in 1927 (123 years later)

3 billion in 1960 (33 years later)

4 billion in 1974 (14 years later)

5 billion in 1987 (13 years later)

6 billion in 1999 (12 years later)

World Population may reach:

7 billion in 2013 (14 years later)

8 billion in 2028 (15 years later)

9 billion in 2054 (26 years later)

10 billion in 2183 (129 years later)

Source: United Nations Population Division. http://www.un.org/esa/population/publications/sixbillion/sixbilpart1.pdf

Of course there *were* local famines, but food and agricultural technology was shown to be more than capable of increasing yields faster than people reproduced. In this respect, Malthus was proved wrong, but pessimists still worried that these gains in productivity were brought about only through hidden impacts on the environment that would one day bite back. In fact the early environmental movement was prone to the belief that actually *any* kind of progress or technical improvement might turn out to be an illusion or a local cosmetic lash-up. A story to illustrate this concerns a friend who had just bought a new vacuum cleaner. She was very pleased with it at first—in fact bragged about its efficacy—but gradually began to feel that something was wrong. After a couple of weeks she discovered that this particular machine had a ‘blow’ as well as a ‘suck’ mode and had been *blowing* rather than sucking all along. The result was that any particular area being cleaned did indeed become very clean as dirt and dust were vigorously blown away. But this cleanliness was bought only at the cost of extra filth distributed almost invisibly elsewhere, which gradually built up to a noticeable and finally intolerable level…. This is more or less how I thought about technology myself in the 70s, and so did many others: that it could indeed solve any local problem, but only at the cost of diffuse damage that would one day become intolerable. Why did we adopt this pessimistic narrative?

Exponential growth is strange and often baffles common sense, but playing about with its mathematics led to several schools of thought critical of trends in post-war culture. Emblematic of the whole approach was the discovery of the so-called ‘hockey-stick’. This is the facetious name given to the shape of the graph describing the growth of a large variety of

Figure 4: The ‘Hockey Stick’ curve that emerges from any exponential process

different factors plotted over several hundred years. It is the result of steady but slow growth in the pre-industrial period, contrasted with explosive exponential growth in the industrial period.

The ‘hockey stick’ pattern applied to, for example, human population, energy consumption, number of motor vehicles, number of new chemicals produced, explosive power of weapons, speed of communication, number of letters delivered, patents registered and so on. This sharply rising limb did seem to mark a qualitatively new era of human experience, and it did prompt the question where―and how―will it end?

Meanwhile there were also questions about the qualitative aspect of modern technology: not just *how much* was happening, but whether the *kinds of things* that were happening were for the best. The most celebrated example was the publication in 1962 of Rachel Carson’s *Silent Spring*. While by modern standards lacking in rigour, it drew widespread attention to the unintended effects of agricultural chemicals, and in particular pesticides. Pesticides were supposed to be the scientific magic bullet that zapped the pests that ate the crops that grew in the field that Jack sowed. Jack was supposed to get a bumper harvest from a crop unmolested by wildlife marauders, and indeed he usually did. But meanwhile the poisoned pests were being eaten by their predators, and then *their* predators, up to the top of the food chain, where resided all the rarest and most celebrated wild creatures, especially the avian raptors: eagles, hawks, buzzards, etc. The pesticides dissolved into fatty tissues and became increasingly concentrated, resulting in sick birds, thinner eggshells and dead chicks. This was increasingly noticed, and finally Carson blew the whistle, followed by a thousand other, increasingly shrill whistles. The magic bullets were not magic at all. They merely solved one local problem at the expense of creating other problems elsewhere, just like my friend’s vacuum cleaner. The ‘meme’ that, possibly, *any attempt at technological progress might ultimately be self-defeating*, spread quickly, and is widely considered to mark the beginning of the modern environmental movement.

We cannot avoid noting here that contrasting narratives are often self-serving for their proponents, and that this enormously complicates the task of interpreting the data objectively. Old fashioned socialists and marketeers alike have an interest in playing down environmental problems and stressing the benefits of economic growth. Environmental activists feed off pessimistic stories. These justify their work, give a meaning to their lives, bring new recruits and grants and membership fees. Cynics think they would continue to tell apocalyptic tales whatever the actual situation. It is also the case that many environmentalists think people would actually be happier with a less crassly consumerist lifestyle (Elgin, 1981), but know they will never persuade them of this directly. So the apocalyptic “it’s a question of sheer survival” story is good for grabbing attention and getting people to think about their lifestyles.

So now we have a number of pessimistic ‘decline’ (or “Jeremiad”) narratives set against the prevailing optimistic Progressive (or “Panglossian”) narrative. Whole books, think tanks, schools of thought grew up dedicated to these two ways of arranging and making sense of the data. On the optimistic side we find ‘technological cornucopians’ (like Simon 1977, 1994, Beckerman 1995) who really believe there are no limits that cannot be overcome. We find these both in capitalist north America and in communist Russia. In fashionable Marxist circles in Europe, it was taboo and a ‘bourgeois deviation’ to suggest that there might be environmental limits to the socialist utopia. Russian delegates to international conferences would blandly declare ‘There are no environmental problems in the Soviet Union’. I heard them.

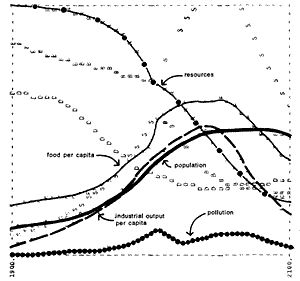


Figure 5: 'Standard Run' from Limits to Growth World3 Model. This is what computer graphics looked like in the early 70s.

But the pessimists were putting things together into a more coherent master-narrative. A milestone report emerged with the title *The Limits to Growth* (Meadows et al, 1972), and became immediately both a

*cause célèbre* and a *bête noir*, depending on the preferred narrative of the reader.

The *Limits to Growth* used a computer modelling technique to explore the interactions of various factors such as population, pollution, food, resource-consumption, industrial output and so on. On the assumptions they used they kept getting dramatic crashes in

the 21st century (see Figure 5). This fitted very nicely with the need for apocalyptic warnings in the green movement (see Harper, 1998)

But the study was savagely criticised for wiring in dubious assumptions that made crashes inevitable (Cole et al., 1973; Smil, 2005). For example they assumed that industrial cultures were crucially dependent on the supply of certain strategic minerals, and that the known reserves of these minerals were fixed. Therefore many mineral supplies had limited lifetimes, and would gradually disappear, leaving advanced societies unable to function. Likewise, they imagined industrial production being strangled by the effects of growing pollution, without consideration of what measures might be taken to mitigate pollution or find alternative processes.

It is interesting that one Jeremiah and one Pangloss did make a wager on minerals. Paul Ehrlich, famous as author of *The Population Bomb* (1968) bet Julian Simon (1977, 1994), equally famous economist and unquenchable optimist, that the price of 5 selected minerals would be greater in 1990 than in 1975. Simon won hands down on all five. But if Ehrlich had said 2010 the result would have been different.

See more on the Ehrlich-Simon wagers in a NY Times article by Tim Kierney http://www.dynamist.com/tfaie/bibliographyArticles/tierneybet.html

In spite of widespread criticism of *The Limits to Growth*, its holistic approach and ‘conditional apocalypse’ message remained extremely influential. And the authors did not give up. They used the passing years to take criticisms into account, refine the model and put in more accurate data. They published *Beyond the Limits* (Meadows *et al,* 1992), that said the same thing all over again [and yet again in 2004: essentially: we can get through if we do x,y,z. If not, we’re stuffed. This is an archetypal narrative: the *conditional apocalypse*. An example of an updated version is shown in Figure 6:

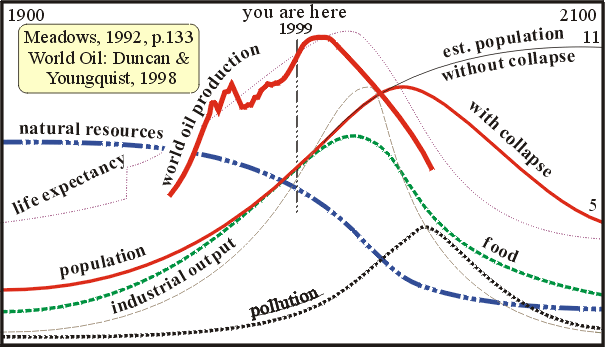


Figure 6

Notice that the interesting bits, the discontinuities, are all *in the future*. Cynics can sneer that this is always the way with prophets. Repent! The End is at Hand! But it never quite happens. All through the 70s and 80s environmentalists expected dire discontinuities, but none occurred. By the 90s they had cried wolf too many times, and gave up even believing it themselves.

For those active in left-wing circles in the 50s and 60s, this is unmistakably reminiscent of the confident predictions of Marxists that capitalism was bound to implode eventually because it is nothing but a giant pyramid-scam. But in spite of booms and busts and slumps, capitalism always bounced back with even more sickening arrogance, and in the end it was *communism* that imploded. Ah no, say the faithful still, that wasn’t *real* communism. Anyway *Next* time it’ll be the end. The End seems always At Hand, but never quite comes.

There is definitely a problem here, in that ‘forces of history’―if indeed there are such―are never ineluctable. There is always a wriggle factor and as the screws tighten, so do efforts at wriggling, and so far we seem to have got away with it. This is central to the optimists and ‘cornucopians’ case: that we are not passive in the face of threats, but can take steps to avert malign outcomes; and because we have an incentive to do so, we will. Oddly, nearly all the most vocal cornucopians are extreme economic liberals, that believe that the mindless mechanisms of free markets are the most effective response, and we don’t really need to do anything in the ways of politics or legislation or campaigning. More than that: we *shouldn’t*.

What keeps pessimists awake at night is the possibility (or probability, even certainty?) that a critical discontinuity will suddenly kick in when we are unprepared, and bring about irreversible changes before we have had a chance to respond. In the original *Limits to Growth* the analogy is given of a water-lily growing in a lake. The water lily doubles in area every day. If it takes thirty days to cover the lake, on what day will the lake be half covered? The mind thinks at first, the 15th day, or no, perhaps a bit later…er…while the answer is of course *the 29th day*. Often enough, with exponential growth, it’s only when it’s nearly too late you realise something is wrong. Another common analogy was of bacteria growing in a culture bottle, taking a long time to get going, then suddenly entering a phase of rapid growth as they consume the resources available, and finally being stifled by their own accumulated waste products.

That is why we make models and run them into the future. We want to explore *conditionalities*. The future could be like x, given y. There is almost nothing we can imagine that is bound to happen whatever, although a few things are a reasonable bet. World population for example, is unlikely to start dropping tomorrow, simply because most people are young and young people are likely to have families. But in a slightly longer time-frame, population change is subject to government policy and other social forces

‘THE LITANY’ according to Bjørn Lomborg

The world’s ecosystems are breaking down

Resources are running out

The population is ever growing

Air and water are becoming more polluted

More and more species are becoming extinct

Forests are disappearing

Coral reefs are dying

Fish stocks are collapsing

Top soil is disappearing

Deserts are growing

Wilderness is increasingly destroyed

The climate is changing irreversibly

….etc. etc.

…….

Box 2

Anyway, let’s go back to the seventies. That’s when many of these patterns became institutionalised, and we saw the emergence of what Bjorn Lomborg (2001) amusingly calls ‘the Litany’, that ritualised roll-call of environmental problems intended to establish a prevailing narrative of conditional apocalypse. Things will fall apart unless….

Unless what? And here the environment movement tended to split into several camps. One school of thought stressed the centrality of **population growth** ((Ehrich 1968, Parsons 1971, Paddock and Paddock 1968). Another stressed the growth of affluence **and the consumer society (**Mishan 1967, Bookchin 1962, Daly 1974) while a third attributed environmental problems largely to **shifts in technology and the makeup of modern economies** (Commoner 1962, Carson 1962, Holdren 1991, Stern 2006). Each pointed to a factor that was going in the ‘wrong’ direction, and urged a change of course.

Then something rather interesting happened. It was noticed that, if these factors are measurable, they have a necessary mathematical relationship to each other. Average affluence for example is essentially GDP per capita or *gdp*/***P***. Environmental impact per unit of production is the total environmental impact (assuming it can be measured) ***I*** divided by the total wealth, i.e. ***I***/*gdp*. Obviously, other things being equal, the environmental impact of a population is proportional to the size of the population. So ***I*** = ***P***(*gdp*/***P***)(***I***/*gdp*). Cancelling gives ***I****=****I*** so this is true by definition.

Some bright neo-Malthusians (Holdren and Ehrlich 1974) devised a more user-friendly version: I = P.A.T where I is total environmental impact, P is the size of the population under consideration, A is average expenditure for all sectors, or ‘affluence’, and T represents the technological and economic\ factors that determine how much impact a given level of affluence will produce.

This rather simple insight has been helpful in constructing the defining parameters of possible future societies, and making sense of the narratives of the past. It also allows us to explain some of the huge disagreements between optimists and pessimists. When you think about it, it is pretty amazing that after nearly forty years we are still arguing the toss about whether the world is going to hell in a handcart, or whether, on the contrary, things are going just fine. Let me give some examples, bearing in mind that these days, a good and fairly quantifiable proxy for ***I*** is the level of greenhouse gas emissions and global warming potential.

Consider a country like Britain. Population grew slightly in the 50s and sixties, and less in the rest of the 20th century. The population at present is more or less flat, and if countries like Japan or Italy are anything to go by, it could easily decline slowly in the 21st century. Let’s assume by 2050 it will be 95% and by 2100 90% of its present value.

Figure 7 shows likely trends of Affluence, Population and Technological in the ‘North’ over the 21st century. The pink line shows their product, that represents the overall environmental impact.

1950

1970

2000

2100

Relative scale with 2000=1

1

***A***N

***P***N

***T***N

Figure 7

Now look at affluence ***A***: this rose quickly in the 50s and sixties, but slowed in the 70s and 80s. Nevertheless it is three times higher in 2000 than it was in 1950. Will this kind of growth continue? Threefold in fifty years is ninefold in 100 years and 81-fold in 200 years. Makes you think doesn’t it? In practice, nobody thinks growth will be anything close to this level, so let’s make the highly conservative (and some would say, highly improbable) assumption that the UK economy only doubles in the 21st century. Now, other things being equal, we could say that on account of ***P*** and ***A***, the environmental impact of the UK population and its activities was about three times worse in 2000 than in 1950. Was it?

No, it was not. By most measures it was actually rather better: air and river quality, area of woodland, acid rain, national parks and nature reserves, protected species. In terms of the carbon emissions we now consider important, it was indeed worse than 1950, but these are now growing very slowly, with a government commitment to reduce to 40% by 2050.

What is happening here? Basically, it seems, we are actually getting a grip on environmental impacts. We mandate smokeless fuels, we switch from coal to gas, and from steam to diesel on the railways, we pass legislation to scrub power-station flue gases, we have lead-free petrol and more efficient car engines, we tighten building regulations for new buildings, we make seaside towns improve their sewage systems. And so on.

The bottom line is that, especially since the rise of modern environmental awareness in the 1970s, advanced rich societies have succeeded in cleaning up faster than their economies are growing. In other words, ***T*** (often called environmental intensity) is going down more rapidly than ***A*** is growing. If we extrapolate these broad trends into the 21st century we could imagine (as many have) ***T*** being at the so-called ‘factor ten’ level or 0.1 of the reference 2000 level. So ***I*** = 0.9 x 2 x 0.1 = 0.18. In other words, it is not implausible to see that by 2100 the environmental impact of the UK could be less than a fifth of what it is now.

Optimists will clap loudly: There you are then, what did we tell you?

But hang on, these are just assumptions. Suppose that economic growth is much faster. We could equally have supposed the economy to be *five* times larger in 2100, with the same population, ie *A*=5. Suppose also that ‘factor 10’ is not achieved, but only ‘factor 4’. Then we have***I***2100= 0.9 x 5 x 0.25 = 1.125 in other words no improvement at all.

But the model allows us to play about with possible sets of assumptions and generate a whole range of what modellers call ‘scenarios’. Usefully, the most plausible scenarios for Britain apply to pretty well any other developed country, because the patterns are very similar. So that first graph could apply to ‘The North’ as a whole, and we are in the attractive position of having a good chunk of a simple but very robust world model.

And we have to say, on any reasonable assumptions for the North, there is generally an improvement. On some assumptions things don’t get much better, but there is no sign of an apocalyptic discontinuity.

What about the global South then? Try a similar exercise. In 1950 population ***P*** was about 2 billion. By 1970 it was around 3 billion and by 2000 5.5 billion. It is certainly growing, but the rate is clearly slowing, and it is expected to level off at 7-8 billion by the end of the century. Average affluence ***A*** is of course low by North standards, but (with some notable exceptions) growing faster than that of the North, more than 5% a year. In the year 2000 average ***A*** was about one tenth of that in the North.

Figure 8 shows Affluence, Population and Technological changes in the ‘South’.

What assumptions shall we make about the 21st century? Let’s put the following idea forward: that by 2100 average affluence in the South will be five times its present level. That would bring it to half the 2000 level of the North, and merely a quarter that of the previously assumed 2100 level of the North. This then assumes that the gap narrows, but is not closed. These assumptions predict that, if ***T*** remains constant, environmental impact of the south will be 1.6 x 5 = *8 times* its present level (which is already widely believed to be causing stress in many areas).

Figure 8

1950

1970

2000

2100

***A***S

***P***S

***T***S

1950

1970

2000

2100

***A***S

***P***S

***T***S

What about ***T*** then? We have seen that it operates to improve things in the North, but we cannot necessarily make this assumption for the South. For one thing, rapidly-growing early-industrial economies have a great deal of energy-and-materials-intensive infrastructure to build up, which the Northern economies have largely accomplished. For another, many of the filthier processes in the North have been deliberately transferred to the South. For yet another, poor societies value economic growth far above environmental quality and are not inclined to vote for it, pay for it, or indeed pay it any attention at all. Therefore for the purposes of constructing an illustrative scenario I shall assume that ***T*** is presently *growing* in the South, will reach a level 50% higher by 2050 before declining to ‘factor 4’ by 2100 (and thereafter to converge with the global norm). [Note added 2008: this is no longer realistic: in general ***T*** is already declining in the South].

Now if we do the sums again we get ***I*** = 1.5 x 2.5 x 1.5 = 5.6 in 2050, and 1.6 x 5 x 0.25 = 2 (phew) in 2100.

Well, if it’s not going to be like this, what other assumptions shall we use? Optimists simply accelerate the progress of ***T***. Pessimists retard it, finding reasons to doubt it. Anyway, let’s put the whole lot together to give a history of the recent environmental future. This is the North Story:

X

22nd century

Period of increasing but un-noticed impact

Default projection

Actual out-turn in North

Widely-expected out-turn

Notional measure of aggregate environmental impacts

Rise of environmental awareness

20th century

21st century

Figure 9

Figure 9 shows a notional measure of environmental impact over time for the North. Figure 10 shows the South Story added

Figure 10

E

D

C

A

B

1-2 billion people

7-8 billion people

1-2 billion people

7-8 billion people

20th Century 21st Century 22nd Century

The big peak in the South can be interpreted here as just a larger version of the pattern in the North. As there are 3-4 times as many people it is not surprising the peak is bigger.

Now the stories begin again. Is this an optimistic or a pessimistic model? You can see how different narratives emerge from focusing on different parts. If all you can see is section ‘A’ (as was the case in the 50s and 60s) it looks bad, potentially anyway, because extrapolation leads to ‘X’ in the previous figure (remember the scale has been compressed to accommodate the peak: ‘A’ did represent vigorous exponential growth).

If however you focus on section B you are likely to generate a progressive, optimistic narrative, because X did not occur. Extrapolation leads to C, a continuous improvement. Focusing on D however, brings back grounds for anxiety because we simply do not know the effects of this level of environmental impact.

Notice that I have drawn the curves quite smoothly, giving the impression that there will be no discontinuities. This is simply an assumption. D is quite unknown territory: we might get through it without major catastrophes, or we might not. But this peak can hardly be wished away, if only because it represents the modernisation of most of humanity and it is hard to imagine a genuinely sustainable world without that once-for-all process. E, if we ever get there, will once again generate positive visions of the future.

So here we have a different narrative pattern that we might call *per ardua ad astra*, [literally, ‘through adversity to the stars’, the motto of the RAF] or more generally, through trials and tribulations to the promised land, a very common structure for novels and films. This is slightly different from the usual dichotomy of “it’s all OK” versus “we’re all doomed unless…”, because it has elements of both.

The drama in the story arises from competing forces: Jared Diamond (2005) in his splendid *Collapse* draws the analogy of a horse-race, with horses of heedless destruction accelerating at the same time as increased awareness and improved technology. Which horse will win? What should we do to improve the odds of the good horse?

Another analogy for the present situation is that of a wide and rather smooth-flowing river, that represents the general progress of humanity up to the present point. In the analogy, boats are carried along by the flow and the occupants go about their businesses, often looking at the views, stopping at harbours along the way to socialise, sightsee or buy provisions. But suddenly a roaring sound is heard in the distance up ahead. Nobody knows quite what it is. The current starts to accelerate. Some passengers with binoculars can see a narrow rocky ravine with rapids and projecting rocks, and beyond that, smooth, clear water once again. They try to tell everybody else about their observation, to prepare for fending off rocks, to batten down the hatches, ready the life-boats and so on. But most of their fellow passengers – and the crew – are too busy playing cards, ordering cocktails or dozing in the sun.

Figure 11: The river of past and future, with discontinuity

“The Rapids”

21st Century

The warnings become more shrill; but those who utter them are treated as irritating spoilsports and scare-mongers. The captain puts out a reassuring message: that the ship is sturdy and everything will be all right. Suddenly the boat enters the rapids and at once all other concerns are put aside as simple survival becomes the most pressing concern. In place of prepared emergency measures there are only ‘emergency’ emergency measures of much less effectiveness. There are recriminations, fights, furious speculation. Will the boat get through? What is the best strategy? Who is to blame? In retrospect, what should have been done? What should the ‘aware’ passengers have done? Does it make a difference that clear water lies ahead?

These are all ethical questions of the kind we often try to grapple with through analogies or stories. It is obvious that a lot depend on context, and the context itself might be a kind of story. Suppose the worst fears of environmentalists are realised, and the entire suite of climate-related catastrophes come to pass. What measure of blame do any of us bear, and how would we defend our actions against the recriminations of, say, a ruined neighbour; or our children; or a remote foreigner who had lost her entire family as a result of a climate-related disaster? How could this be cast into the form of a story?

One that has been suggested is an after-death encounter with St Peter at the gates of heaven. In popular tradition St Peter holds the keys of heaven and acts as a kind of celestial bouncer, quizzing prospective entrants to establish their worthiness. It is commonly thought you can blag your way in by telling a good story.

Imagine then, you arrive at the Pearly Gates and St Peter fixes you with a cold stare. “As you well know,” he says, “the earth, the sacred handiwork of the Almighty, has been reduced to a steaming ruin. You were there. Why didn’t you stop it?”. What would you say?

Try these responses for size:

* I did my bit! If everybody had done as I did, it would have been all right
* I didn’t know anything about it
* I didn’t know what to do, nobody told me
* The evidence was too confusing
* There was no mention of the problem in Holy Scripture, surely that lets me off the hook?
* Isn’t it the job of politicians, or civil servants, to sort these things out?
* I tried to persuade everybody, but they wouldn’t listen, so I gave up
* You can’t fight progress/fate/human nature
* In the long run everything will sort itself out; we’ve seen worse
* I had the kids to look after

etc

“St Peter” is a heuristic metaphor that sheds light on our attempts to make moral sense of things ourselves, or to justify our stance to friends. Here are some more formalised types of response to the prospect of Grand Catastrophe, each with a set of buttressing narratives of its own:

* You could deny any knowledge of the hypothetical catastrophe. Most people do.
* You could help to keep it at bay by seeking out, repeating and elaborating narratives that minimise its importance.
* You could decide to try and *prevent* it, either by ‘bottom-up’ personal reform, hoping to set a good example, or through ‘top-down’ political and collective action. These represent the two main wings of the environmental movement.
* As a special case, you might pray for a ‘miraculous’ change of heart in the whole population, believing that hidden spiritual forces are helping us.
* You could accept it, conclude that it is inevitable and take steps to adapt. This could be
  + on a personal level, retreating to the hills with guns and lots of tinned food, or
  + on a collective UK level, organising raised flood barriers and measures to fend off refugees, or
  + on a collective world level, trying to decide which populations can be ‘saved’ and which must be allowed to…..
* You could develop a more robust, detached, long-term set of ethics, such as those of James Lovelock, who expects the human population to shrink by 80% in this century. He regards this process as a kind of ‘course correction’ that puts humanity on a genuinely sustainable path.
* Or you could just eat, drink and be merry and enjoy life while you can

Conclusion

In this lecture we have discovered that there are many conflicting viewpoints, all which shape our world view and make us who we are. Authors of many seminal ‘boomer’ or ‘doomer’ works are still both claiming that they were right all along and we are facing the best times ever *or* global meltdown, depending on what they predicted in the first place. But the fact remains that whatever modelling we do, we cannot always predict all of what the future will hold.

This lecture will invite you to ask, “Why do I pick *this* particular narrative framework, and not *that* one?”. “Why do other people make entirely different choices?”. “Given that this is the case, how do we communicate with those who operate on different narratives, and how do we undertake joint actions?”

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