Geoengineering (excerpt from Thoughts on a Quiet Crisis - book in progress)

....the process, of starting small to establish proof of concept and then scaling up, is frequently likened to the spread of farming. This also was a technological innovation that started small and spread gradually across the globe to become ubiquitous. Wherever it has been established farming has caused major environmental changes and on a global scale the sum of these truly has altered the face of our planet. The damage it has caused along the way has nevertheless generally been localised and limited. No major global catastrophes have occurred. As a model of human geoengineering it is therefore a good one. It provides confidence that, as humans meddling with planetary scale systems, we can get it right. And of course this is exactly why this metaphor (and not industrialisation which is the cause of global warming) is used. It tells us to have confidence in our technological expertise. The question that needs answering, however, is whether it fairly represents what is happening now. Can we rest assured that modern geoengineering will follow the farming format?

If we stay for the moment with the small projects that need, like farming, to be scaled up, there are a number of issues that suggest the metaphor isn't apt. First we have context. Farming was introduced slowly. Those introducing it gradually changed their lifestyles, and with it their environment. There was no rush and no urgency with the natural biological world being given 10,000 years in which to gradually adapt. No bridges were presumptuously burned. By contrast the present changes are being rushed in to fix what many scientists and technologists perceive as a planetary emergency. There is a palpable sense of urgency. For instance Europe and the United States both imposed statutory targets for biofuel use long before their economic and environmental credentials could be properly established at the small scale. In the process they have provided funding, and occasionally very large scale funding, for inappropriate technologies that have caused economic and ecological damage and human suffering. US corn ethanol is simply the most extreme of these products. Examples such as this provide no reassurance at all that other small scale projects won't be also scaled up long before their concept is “proved”. We are, as a result, taking risks on a level far, far beyond the comprehension, or the imagination, of those who sowed the first gathered seeds.

Secondly we have the issue of our accelerating potential for damage. This results first of all from the inevitability that our actions will have unforeseen and unintended consequences which are then intensified by the invasive and fundamental potentials of our modern technologies, by the ease of access we have to them which is facilitating unaccountable private initiatives, by the speed of transmission now available for spreading their harmful effects and by the lack of barriers that could prevent or hinder such spread[1]. By comparison farming, when it was first introduced was decidedly low tech and its consequences were local, relatively confined and obvious. It is now far more difficult to comprehend the dynamics that might be set in motion by, for instance, cloud whitening, or the fertilisation of the oceans.

And thirdly we have a little gem called the mereological fallacy. Mereology itself tells us that “the whole is always more that the sum of the parts”, or, put in more modern terms, that the information contained in any dynamic system is always more than all of the information in all of the parts added together. Scale in other words adds levels of complexity that cannot be forecast from studying the parts[2]. And this leads directly to the fallacy which says that it is wrong to imagine that, by studying the behaviour of the parts of a system even in the very greatest of detail, we will be able to forecast the behaviour of the whole. Scale itself adds extra information that confounds such a presumption. Consequently, even when we have an excellent understanding of small scale systems, we will still find ourselves taking a leap into the dark, into the unknown and the unknowable, when we opt to increase their scale. So whilst proof of concept at the small scale is useful and isn't wasted it is only part of the picture the rest of which will only be revealed when the scale increase is undertaken. Then however we need to expect the unexpected. And this tells us that such scale increases need to be undertaken slowly, rather like farming, with precaution and with vigilance so that, if unwanted reactions are detected we can scale back before, hopefully, they get out of control. And yet this isn't, as we have seen, how we presently function. The old wisdom of prudence has been replaced by a new “wisdom” of risk.

Here then we get to the crux of geoengineering's fallibility, whether it is started from the small scale or the large. This is that it turns the whole Earth into an experiment the consequences of which cannot be foreseen. This is perhaps easiest to see with very large scale projects like placing

1 Martin Rees, “Our Final Century”, 2003, Arrow Books

2 As outlined by Peter Hacker in Maxwell Bennett, Daniel Dennett, Peter Hacker and John Searle "Neuroscience and Philosophy", 2009, Columbia University Press.

membranes in space. We know that these processes must interfere with the large scale dynamics of the Earth's planetary scale systems. We know that here the Earth itself is the experiment. It is less obvious that this is the case with small scale projects that are “simply” scaled up. This nevertheless is what the mereological fallacy tells us. And of course the problem with experiments is that they are experiments, their results cannot be foreseen. Consequently when we turn our planet, which is our sole source of security, nourishment and life, into that experiment we must be prepared for it to fail. We must be prepared to forgo the benefits our planet provides.

And yet, even here, we still haven't reached the end of geoengineering's problems. A further difficulty will arise if the experiment succeeds. This is that the whole purpose of these projects is to bring the dynamics of our planetary systems back into balance even as we are being encouraged by the concept of the technological fix to continue with business as usual. Business as usual is our continuation of our consumer lifestyles, our continued exploitation of fossil fuels, and our continued emission of global warming gases without any thought for the melting ice sheets, the melting tundra, the rising sea levels, the droughts, the famines, the floods, the extremes of heat, the human migrations or the human suffering. These it is being suggested are fixable. We, therefore, simply carry on as we are. This however assumes that someone, somewhere will have a clear view of the road ahead, and will have the capacity and ability to steer this vehicle competently and carefully even as it has to go faster and faster and even as the terrain gets more and more extreme. Whoever this is will need to be able escalate the impact of the various geofixes as necessary, be able to know and comprehend all their effects, have the ability to comprehend their interacting dynamics, have the ability to coordinate and control them as one, be able to foresee any unexpected dynamics that are being created, and be able to turn off fixes before uncontrollable side effects occur, so that the entire system can be maintained in balance even as our own behaviour pushes the extremes to the limit. This clearly doesn't describe a system gradually getting back into balance but one destined to veer increasingly towards instability and chaos. We are, nevertheless, setting off along this route. Imagining that we could have the necessary knowledge, expertise, understanding, wisdom, skill, coordination, and control over all the necessary resources and that we could use them without major error or failure across incalculable time, however, stretches credulity beyond limit after limit after limit. It demonstrates yet another, but undoubtedly the final, peak of human hubris.

And yet still we haven't reached the end of the problems! The further difficulty we have is that in placing all our eggs in the technological basket we simply assume that the resources, the energy, will be there so that they can hatch and grow. This is a very big assumption. One of the main difficulties with complexity is that when it increases so does its requirement for energy. This happens, as we have seen, even with the supposedly energy saving technologies such as IT. Although they may provide us with savings in the energy cost per unit the increase in the number of units used more than makes up. As a result energy usage persistently increases with complexity, and the converse is also true. Complexity cannot continue to increase without an increase in the available energy[3] . It follows that when we place our faith in increased technological complexity we place our faith in an ever increasing supply of energy. It is consequently ironic, as a mild understatement, that we could be making such a wholehearted and irreversible commitment to the technological option of geoengineering, a commitment that has no reverse gear, at the very point when the probability of our energy supplies imminently peaking is high and increasing. If this turns out to be true not only can we not rely on the continuing doubling of energy supplies every 35 years, nor on a 50% increase, nor a 30% increase, nor even a 10% increase, we should, rather, be assuming an energy reduction. And if this is the case there will be no energy available to drive the ever increasing technological complexity that will be required. Geoengineering will be dead in the water - a mere mirage of hope.

And yet, even at this point, having been wholly critical of geoengineering's ability and capacity to achieve what it is setting out to achieve, it is still possible to find yet another, and even more damning criticism. This is that the problem it is setting out to resolve, global warming, is the wrong problem. Consequently when we set out to follow its simple technological logic we find ourselves being led down a blind alley to a very dead end.

The irony in this is that by following the geoengineering path we are likely to save the planet, just not in the way we anticipate. Because it focusses all our attentions on global warming it necessarily distracts us from the issues that propel us towards civilisational collapse. We ignore our escalating consumption, we ignore our advancing population, we hide our diminishing marginal returns under new happiness indices, we continue to place efficiency first, we sideline the importance of diversity, we protect structures that are too big to fail, we continue to homogenise

3 For instance see “The energy-complexity spiral” in Joseph Tainter and Tadeusz Patzek “Drilling Down”, 2012, Copernicus Books.

our world, and by all these means we continue to reduce our resilience and make ourselves ever more vulnerable to shock[4]. But not only this. We also positively compound the problems by investing ever increasing amounts of energy, money, and human resources in geoengineering projects. By doing so we increase our energy stress, we accelerate our diminishing energy returns, we direct our remaining capacities for innovation into ever increasing control, we place new reliance upon structures too important to fail, and we become further enmeshed in global structures of control. As such we increase the rigidity of our systems within ever narrowing boundaries, we increase our vulnerability to shock and we hasten our demise.

For the world, and for its global warming, this is probably the ideal solution. The cause of the problem, the large human populations that emit vast amounts of global warming gases will very quickly disappear and the world will be saved. Admittedly this won't be pleasant period for us humans but our sufferings will be relatively brief and then we will be gone. The world we leave will at least have a chance to recover so that eventually new species will arise in our place. However, unlike us, they won't have vast stores of fossil energy to exploit, all the accessible productive sources will have been used. They will instead have to survive on biological energy sustained directly from the sun. They will consequently have no opportunity to develop the complex systems that we have developed and they will need to live far simpler and far more sustainable lives. This perhaps is how it should be.

So geoengineering is by no means a lost cause! It is rather the final solution!

If, however, this isn't the solution we would want we will need to find another way.

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4 Brian Walker & David Salt, "Resilience Thinking", 2006, Island Press.