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## An Eruption of Reality

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Has our society become too complex to sustain?

By George Monbiot, published in the Guardian 19th April 2010

Man proposes; nature disposes. We are seldom more vulnerable than when we feel insulated. The miracle of modern flight protected us from gravity, atmosphere, culture, geography. It made everywhere feel local, interchangeable. Nature interjects, and we encounter - tragically for many - the reality of thousands of miles of separation. We discover that we have not escaped from the physical world after all.

Complex, connected societies are more resilient than simple ones - up to a point. During the east African droughts of the early 1990s, I saw at first hand what anthropologists and economists have long predicted: those people who had the fewest trading partners were hit hardest. Connectivity provided people with insurance: the wider the geographical area they could draw food from, the less they were hurt by a regional famine.

But beyond a certain level, connectivity becomes a hazard. The longer and more complex the lines of communication and the more dependent we become on production and business elsewhere, the greater the potential for disruption. This is one of the lessons of the banking crisis. Impoverished mortgage defaulters in the United States - the butterfly's wing over the Atlantic - almost broke the global economy. If the Eyjafjallajökull volcano - by no means a monster - keeps retching it could, in these fragile times, produce the same effect.

We have several such vulnerabilities. The most catastrophic would be an unexpected coronal mass ejection - a solar storm - which causes a surge of direct current down our electricity grids, taking out the transformers. It could happen in seconds; the damage and collapse would take years to reverse, if we ever recovered. We would soon become aware of our dependence on electricity: an asset which, like oxygen, we notice only when it fails.

As New Scientist magazine points out, an event like this would knacker most of the systems which keep us alive(1,2). It would take out water treatment plants and pumping stations. It would paralyse oil pumping and delivery, which would quickly bring down food supplies. It would clobber hospitals, financial systems and just about every kind of business - even the manufacturers of candles and paraffin lamps. Emergency generators would function only until the oil ran out. Burnt-out transformers cannot be repaired; they must be replaced. Over the past year I've sent freedom of information requests to electricity transmitters and distributors, asking them what contingency plans they have made, and whether they have stockpiled transformers to replace any destroyed by a solar storm. I haven't got to the end of it yet, but the early results suggest that they haven't.

There's a similar lack of planning for the possibility that global supplies of oil might soon peak then go

into decline. My FoI requests to the British government reveal that it has made no contingency plans, on the grounds that it doesn't believe it will happen<sup>(3)</sup>. The issue remains the preserve of bearded lentil-eaters such as, er, the United States Joint Forces Command. Its latest report on possible future conflicts maintains that "a severe energy crunch is inevitable without a massive expansion of production and refining capacity."<sup>(4)</sup> It suggests that "by 2012, surplus oil production capacity could entirely disappear, and as early as 2015, the shortfall in output could reach nearly 10 million barrels per day." A shortage of refining and production capacity is not the same thing as peak oil, but the report warns that a chronic constraint looms behind the immediate crisis: even under "the most optimistic scenario ... petroleum production will be hard pressed to meet the expected future demand".

A global oil shortage would soon expose the weaknesses of our complex economic systems. As the cultural anthropologist Joseph Tainter has shown, their dependence on high energy use is one of the factors that makes complex societies vulnerable to collapse<sup>(5)</sup>.

His work has helped to overturn the old assumption that social complexity is a response to surplus energy. Instead, he proposes, complexity drives higher energy production. While complexity solves many problems - such as reliance on an exclusively local and therefore vulnerable food supply - it's subject to diminishing returns. In extreme cases the cost of maintaining such systems causes them to collapse.

Tainter gives the example of the western Roman empire. In the third and fourth centuries AD, the emperors Diocletian and Constantine sought to rebuild their diminished territories. "The strategy of the later Roman Empire was to respond to a near-fatal challenge in the third century by increasing the size, complexity, power, and costliness of ... the government and its army. ... The benefit/cost ratio of imperial government declined. In the end the Western Roman Empire could no longer afford the problem of its own existence."<sup>(6)</sup> The empire was ruined by the taxes and levies on manpower Diocletian and Constantine imposed to sustain their massive system. Invasion and collapse were the inevitable result.

He contrasts this with the strategies of the Byzantine empire from the seventh century onwards. Weakened by plague and re-invasion, the government responded with a programme of systematic simplification. Instead of maintaining and paying its army, it granted soldiers land in return for hereditary military service: from then on they had to carry their own costs. It reduced the size and complexity of the administration and left people to fend for themselves. The empire survived and expanded.

A similar process is taking place in the UK today: a simplification of government in response to crisis. But while the public sector is being pared down, both government and private enterprise seek to increase the size and complexity of the rest of the economy. If the financial crisis were the only constraint we faced, this might be a sensible strategy. But the energy costs, environmental impacts and vulnerability to disruption of our super-specialised society have surely already reached the point at which they outweigh the benefits of increasing complexity.

For the third time in two years we've discovered that flying is one of the weakest links in our overstretched system. In 2008 the rising cost of fuel drove several airlines out of business. The recession compounded the damage; the volcano might ruin several more. Energy-hungry, weather-dependent, easily disrupted, a large aviation industry is one of the hardest sectors for any society to sustain, especially one beginning to encounter a series of crises. The greater our dependence on flying, the more vulnerable we are likely to become.

Over the past few days people living under the flight paths have seen the future, and they like it. The state of global oil supplies, the industry's social and environmental costs and its extreme vulnerability mean that current levels of flying - let alone the growth the government anticipates - cannot be maintained indefinitely. We have a choice. We can start decommissioning this industry while there is time and find ways of living happily with less of it. Or we can sit and wait for physical reality to simplify the system by more brutal means.

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