

The Future is Clean: The Sixth Industrial Revolution

In this article Peter Heslam draws attention to six industrial revolutions, three historical, three contemporary. The last of them, which he calls 'the clean revolution', represents one of the greatest challenges and opportunities for individuals and businesses in the 21st century. Joining it can change our world view.

The first industrial revolution began in Britain around 1780 with the mechanisation of the textile industry and the harnessing of steam power. This so assisted the division of labour that the factory, rather than the weaver's cottage, became the engine of production. The second industrial revolution centred on electricity and steel, and paved the way for mass production - the third industrial revolution - symbolised by Henry Ford's moving assembly line.

These three revolutions were decisive in the rise of the middle classes, the expansion of education and democracy, and the birth of the modern city. Without these social shifts, the remaining three industrial revolutions, still unfolding today, are unimaginable.

First amongst these is the information and communication technology (ICT) revolution. Brands such as Microsoft, Apple and Google are so familiar today that the revolutionary nature of this shift is often unperceived. The fifth industrial revolution is currently less pervasive. Sometimes loosely associated with the 'Internet of Things' or 'Industry 4.0', it represents a convergence of new

technologies and web-based processes such as those utilised in 3D printing.

Consequently, churning out millions of identical products is making way for customised goods that can be controlled from a laptop. The factory is returning to the weaver's cottage. This time, however, the cottage can be in an African village, where a tool, a spare part, or a health care item can be downloaded and printed.

In the sixth place is the clean revolution. This may seem older than it is, as environmental concerns have been growing since the early 1960s, when Rachel Carson published *Silent Spring*. But the environmental angst of the hippy generation is being replaced by the opportunity mindset of the entrepreneur generation. Not only does it wear smarter clothes. It also designs smarter technologies.

The shift is reflected in a new initiative, a new invention and a new turn in an economy. The new initiative, called Global Apollo, takes inspiration from the Apollo space programme. Led by scientists, its mission is to promote the technological advances needed to transition, within ten years, from

fossil fuels to renewable energy. That is ambitious but the recent commitment made by the G7 countries to cease all carbon burning by 2100 bodes well.

So too does the new invention: the Solar Impulse, a solar-powered plane. Created by the Swiss entrepreneurs Bertrand Piccard and André Borschberg, it is the first aeroplane to fly day and night without fuel. By circumnavigating the globe they aim to demonstrate what is possible when clean energy and technology are driven by the spirit of enterprise.

China is keen to be part of this revolution. Having seen its carbon output soar to almost 30% of global emissions, it is gradually disinvesting from carbon-based industry. While some of this reflects a slowing economy, Beijing's determination to decrease coal consumption means that the country's emissions could peak by 2025, five years sooner than pledged. This may make achievable the international goal of limiting global warming to 2°C above pre-industrial levels.

On the basis of sound scientific evidence, the decarbonisation of the economy is something all Christians



Solar Impulse 1 flying over the Golden Gate

should support. The first divine commission human beings receive, according to Genesis, is to tend God's creation. Their mandate is not to exploit it in a destructive way, as some have suggested, but to cause it to flourish.

This does not mean that the use of carbon reserves to meet human energy requirements should be judged sinful. Without such use, the first three industrial revolutions and their multiple benefits would not have occurred, even though these benefits came with significant human and environmental cost.

Failure to use these resources would also mean the second three industrial revolutions, still ongoing, would have been impossible. While the earth may now be greener had industrialisation not taken place, it


would probably also be blighted with greater poverty and disease. It would also suffer more from the harm nature can inflict on itself through parasites, weeds, animal predation and severe weather. Those most exposed to these realities are still the poor, as they are the ones most excluded from industry's gains. That is why they tend to be less romantic about the natural world than the rich, who often regard it as little more than a leisure destination.

Unusually for a theologian, Abraham Kuyper (1837–1920) understood the benefits of industrialisation. He wrote that the division of labour associated with it 'brings to light treasures that were once hidden, increases man's power over nature, counteracts much suffering, turns aside much danger, and in numerous ways makes life much richer.' He

argued that in the power of steam and electricity that enabled all this, ordinances of God lay hidden for centuries. Only at the appointed time did God raise up people to make the necessary discoveries.

Belief in God's providence in history aside, Kuyper's ideas invite us to see carbon-based energy, and the capacity to utilise it, as a gift from God. Seeing things this way would help us ensure that our use of such energy reflects the giver by promoting human and environmental wellbeing. It would also help us shun disdain for resources of the earth that are the result of something so innocent as sunlight falling on leaves.

We now know, from using the analytical capacities with which we have been endowed, that the burning of those resources to release their solar energy can be harmful to the very life the earth sustains.

Nevertheless, energy needs will rise, as humans continue to 'go forth and multiply'. That is why the clean revolution is such good news that we should share it, and so crucial to our planet's wellbeing that we should join it. 



Dr Peter Heslam is Director of Transforming Business, University of Cambridge, and of the Entrepreneurial Leadership Initiative, University of Oxford (psh20@cam.ac.uk).