Net zero emissions: What's in a date?

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Arguably the principal environmental burden facing inhabitants of Planet Earth is the prospect of "global warming" (or "global heating" as recently suggested as a more appropriate term by a senior UK Met Office scientist) caused by the enhanced greenhouse effect resulting from fossil fuel combustion.

Carbon dioxide (CO_2) is the principal "greenhouse gas" (GHG) with an atmospheric residence time of about 100 years. Changes in atmospheric concentrations of such GHGs affect the energy balance of the global climate system. Human activities have led to dramatic increases since 1950 in atmospheric CO_2; concentrations have risen from 330 parts per million (ppm) in 1975 to about 430 ppm currently. The most recent (2013) scientific assessment by the Intergovernmental Panel on Climate Change (IPCC) asserts that it is "extremely likely" that humans are the dominant influence on the observed global warming since the mid-20th Century.

The 2015 Paris Agreement on climate change aims to keep temperatures "well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels." However, bottom-up national pledges on GHG mitigation efforts received in connection with the Paris Conference are expected to result in a warming of around 2.7°C. So the world still faces a significant test of reducing GHG emissions further in order to bring global warming into line with the aspirations in the Paris Agreement.

Indeed, the IPCC in their recent "special report," on the implications of keeping temperatures down to 1.5°C, argued that humanity has just 12 years to respond to the climate change challenge (i.e. by about 2030, rather than 2050 presently incorporated in international agreements), if it wishes to keep global warming to 1.5°C above pre-industrial levels. Thus, it needs to instigate appropriate actions in the very near future.

It has become apparent that climate-driven changes and disruptions around the world constitute a climate emergency—a situation that poses a near-term risk to health or life, property, and the environment. Given the uncertainties in the climate science and model projections, these can't all be attributed to global warming. Nevertheless, the UK Government's former Chief Scientific Advisor Professor Sir David King

(actually a materials scientist by professional background) has said that he is "scared" by the number of extreme weather events, and loss of land ice and sea ice.

Sir David has called for Britain to advance its climate target by 10 years (from the current one of 2050), and the Swedish teenage environmental activist Greta Thunberg, in her speech to the recent UN Climate Action summit in New York, suggested that "for more than 30 years the science has been crystal clear." That, of course, is untrue. The climate science has become progressively clearer, but there are differing views on the targets and dates that need to be adopted by various countries and regions of the world in order to mitigate climate change.

As the name implies, "global warming" is a worldwide atmospheric phenomenon. In 2015 the UK contributed just 1 percent to global GHG emissions, whilst China emitted 22 percent, the U.S. 13 percent, the rest of the European Union (EU-28) 7 percent, India 7 percent, the Russia Federation 4 percent, Brazil 3 percent, and Japan 2 percent. Consequently, in order to mitigate climate change, the focus on reducing emissions requires action principally by these major emitter nations and regions.

It is argued by some that cumulative emissions from fossil fuels (emitted over the period 1870-2017)—i.e. since the Industrial Revolution in the UK—have led to the U.S. contributing 25 percent of historical emissions. This is nearly twice as much as China (13 percent), whilst the EU-28 emitted 22 percent historically, Russia 7 percent, Japan 4 percent, and India 3 percent. Many of the larger annual emitters today, such as India and Brazil, are not therefore particularly significant in a historic context.

Likewise, per capita GHG emissions in regional terms are sometimes used as part of an ethical argument over the responsibility for climate

change: North America 13 tonnes of CO_2 (tCO_2) per person, Europe and the Middle East both about 8 tCO_2, Asia 4 tCO_2, South America 3 tCO_2, and Africa only 1 tCO_2. The global average was 4.8 tCO_2 per capita in 2017.

It has therefore been suggested that the large per capita emitter industrialized countries should contract or reduce their GHG emissions, while that of the less developed nations is permitted to rise allowing economic growth in those countries. This climate change strategy is often referred to as "contraction and convergence." However, comparisons made on this basis reflect an "ethical construct'; arguments based on moral considerations, not on scientific ones.

Notwithstanding the relatively modest annual GHG emissions from the UK, the British Government introduced a bold, legally binding target of reducing the nation's CO_2 emissions overall by 80 percent by 2050 in comparison to a 1990 baseline in their 2008 Climate Change Act. This initiative led the way globally a decade ago, and subsequent pathways for achieving such GHG savings are typically known as "deep decarbonization." The 2°C global warming target agreed as part of the Paris Agreement is broadly consistent with the 80 percent UK CO_2 emissions reduction target for 2050. In 2018 the UK Government asked its independent expert group—the Committee on Climate Change (CCC) - to give it advice on the possible tightening of the 2050 target in light of the preferred 1.5°C global warming recommended under the Paris Agreement. Its subsequent report advocated a new emissions target for the UK: net-zero GHGs by 2050, i.e., balancing emissions with CO_2 removal, or so-called "carbon neutrality."

The CCC argued that this net-zero target is "achievable with known technologies, alongside improvements in people's lives, and within the expected economic cost that Parliament accepted when it legislated the existing 2050 target for an 80 percent reduction from 1990." They also

advised that the steepest reductions in GHG emissions should occur before 2030.

They suggest that the readily available options include low-carbon electricity [from nuclear power and renewable energy sources {bioenergy, solar photovoltaic (PV) arrays, and wind turbines}, which would need to quadruple by 2050], energy efficient buildings with low-carbon heating (required throughout the UK's building stock, both new and existing structures), electric vehicles (which they view as the only proven light vehicle option by about 2035), developing carbon capture and storage (CCS) technology and low-carbon hydrogen (which the CCC regard as necessities not just options). In addition, the CCC propose phasing-out potent fluorinated gases, increasing tree planting, adopting measures to reduce GHG emissions on farms, and stopping biodegradable waste going to landfill.

Such policies should together deliver tangible GHG emissions reductions, although the CCC viewed current UK climate change policy as being insufficient to meet even the original 2050 targets (i.e., an 80 percent reduction against the 1990 baseline). One of the last acts of Theresa May's Conservative Government in June was to alter the Climate Change Act to embrace a new target of net-zero GHG emissions by 2050; the first amongst the G7 industrialized countries.

The challenges of a net-zero emissions strategy by 2050 will be severe (as the CCC have made clear), and will fall disproportionately on the relatively poor. They should be addressed in collaboration with our international, particularly European, partners. Despite the fact that the UK emits just 1 percent of annual global GHG emissions, some environmentalist campaigning organizations, political parties and others have advocated a much more rapid transition in this country. For example, the Extinction Rebellion demands a net-zero target for 2025, the Labour Party has suggested 2030 (as part of its recently proposed

Green New Deal), Sir David King wants 2040, and the Campaign to Protect Rural England (CPRE) advocates 2045.

The earlier dates are practically unrealistic as reflected in the CCC evaluation of the net-zero 2050 target. They are suggested largely by middle class proponents who believe Britain should take a moral lead on climate change. But, in arguing the case for significant climate change mitigation measures, the advocates should be honest with the ordinary men, women and children "in the street." The ultimate "costs" and lifestyle changes associated with many low-carbon options—for buildings, transport, food production, consumer products and electricity generation—will disproportionately fall on the relatively poor in society. Their real sacrifices will, after all, only make a modest contribution towards stabilizing the global environment (the average ground-level atmospheric temperature) and thereby addressing the climate emergency. To resolve this threat, vigorous action needs to be taken at an international level by the likes of China, the U.S., what is likely to become the EU-27, India, and Russia in the interests of all the inhabitants (or species) on Planet Earth. The rich nations will obviously need to financially support the take-up of climate mitigation measures within the less developed ones in the run-up to a net-zero world; ideally by 2050.

Britain will be well-placed to influence the debate (even after a potential Brexit) as a signatory of the United Nations Framework Convention on Climate Change (UNFCCC), as well as being a member of The Commonwealth (of 53 countries spanning Africa, Asia, the Americas, Europe and the Pacific), the G7 and G20 groups of nations, the IPCC, and specifically as the holder of the Presidency of International Climate Summit (26th Conference of the Parties or COP26) - to be held, jointly with Italy, in Glasgow (Scotland) in November 2020.

The latter meeting will assess progress to date on achieving the climate

change mitigation pledges made at the 2015 Paris Climate Conference. It included a five-yearly "ratchet mechanism," and consequently COP26 will be the first time that signatory countries are required to upgrade their climate change pledges through to 2030. Determining whether or not countries like China, the U.S., EU-27, India, and indeed the UK, have acted on their national commitments to cut or curb GHG emissions will be a critical task.

Under the Paris Agreement each country sets its own level of ambition. The UK's net-zero target for 2050 is an agenda-setting one, and there have been other promising developments across the European Union. But getting significant reductions from China, the U.S., India, Russia and Brazil, which together emit over half of global GHG emissions, going forward may be difficult to secure. COP26 will take place just days after the US Presidential Election, and the date when Donald Trump intends to pull the U.S. out of the Paris Agreement.

In addition, concerns over the possibility of "free-riding" (whereby countries rely on the GHG emissions reductions of other nations without adopting proportionate abatement actions themselves), historic post-colonial tensions, international trade disputes, and the desirability of securing national energy security, could all inhibit progress.

The extent to which COP26 can reach beyond the wealthy industrialized "North" of the planet to drive sustainable development in the poorer "Majority South," and likewise win support from the so-called "petrostates," may determine success or disappointment. Nevertheless cities, businesses, environmental campaigning organizations, faith groups, regional governments, universities and individuals around the world are endeavoring to play their part in climate change mitigation. COP26 could therefore build on this groundswell of ambition and effort in order to mobilize "all of society" to make the meeting a success. There is much to play for.

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