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ENERGY SCENARIOS

Making demand reductions permanent

The COVID-19 pandemic led to drastic adjustments in how people live and work, resulting in substantial reductions in energy demand and greenhouse gas emissions. New research shows how energy and climate policy can capitalize on these changes to achieve long-term emission reduction.

Florian Knobloch

During the COVID-19 pandemic, businesses had to adjust their operations and people their behaviour in order to contain the spread of the virus. Countries closed their borders, restaurants closed their doors and many companies closed their offices. As people had to stay at home and practice social distancing, the rapid uptake of practices such as remote-working and commuting by bike significantly reduced energy demand, leading to unprecedented drops in greenhouse gas emissions[1]. However, it remains unclear if once the pandemic is over, people will stick to their pandemic routines or revert to their old lifestyles — and how relevant any changes will be for longer-term climate mitigation.

In new work published in *Nature Energy*, Kikstra et al.[2] analyse if a 'lock in' of sustainable energy-demand patterns could indeed present a unique opportunity for achieving climate policy goals. The researchers ask, what would be the effect if the COVID-19-related changes in energy use were permanent instead of temporary. To answer this question, the study simulates alternative 'green' and 'brown' recovery scenarios, with a varying persistence of COVID-19-related changes in energy demand. The results show that although the changes induced by the COVID-19 pandemic can help to reduce energy demand and CO_2 emissions, these reductions are small in comparison to the overall targets and hardly make a long-term difference for the climate.

In the optimistic green scenarios, it is assumed that people have learned from their lockdown experiences, so that pandemic-related shifts in energy-demand behaviour would persist over the medium-term: In such a world, an increased use of teleworking would remain the 'new normal'. The use of private cars, aviation and office space would thus remain lower, in turn reducing global demand for steel and aluminium. This is in contrast to brown scenarios, in which society would revert back to pre-pandemic energy system structures.

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The scenarios are based on detailed bottom-up assumptions on end-use behaviour in three key energy demand sectors: transport, buildings, and industry. These scenario assumptions are fed into an integrated model, which simulates the global economy and the energy system for future decades. This integrated energy-economy model is used to understand the potential impacts of persisting demand-side changes until 2035, including feedbacks, such as the impact of reduced electricity demand on the power sector. While the methodology is similar to earlier work by Grubler et al.[3], it is the first time that a combination of integrated assessment modelling and bottom-up energy-demand analysis is used for analysing post-COVID-19 scenarios.

There are two main lessons from this study, a realistic and a more optimistic one. First, the scenario results clearly demonstrate that not even a global pandemic can save humanity from climate change. The overall impact of a green recovery pathway on long-term energy demand and greenhouse gas emissions is almost insignificant. From a more optimistic point of view, however, such a green recovery could make the remaining decarbonization challenge both cheaper and easier.

Realistically, even under very optimistic assumptions, both energy-demand and emissions will recover quickly and resume growing along their pre-COVID-19 trend. The study projects that even in a green recovery, global energy demand surpasses its pre-pandemic 2019 levels as early as 2023, compared to 2021 in a brown recovery. CO_2 emissions follow a similar trend, reaching their pre-pandemic levels between 2023–2033. So even in a best-case 'green' scenario, ambitious climate policies are still required. This is hardly surprising, given that the estimated global drop in greenhouse gas emissions in 2020 was not larger than 6% — far from the 100% reduction that is required by 2050 for staying within the 1.5 °C goal.

The optimistic result is that the lessons learned during the COVID-19 pandemic

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could make the climate challenge a bit easier. If people would stick to their newly learned green low-energy habits, the resulting energy demand could permanently remain lower, compared to more energy-intensive pre-COVID-19 lifestyles. This could make it both easier and cheaper to decarbonize the energy system and reach the Paris climate goals, potentially saving society huge amounts of money: it is estimated that in order to meet the 1.5 °C target in a brown recovery scenario, necessary investments are 9% higher compared to a green recovery. The reason is that, given a relatively higher energy demand, a faster growth of renewable energy, such as wind energy, is required for decarbonizing the energy system.

One take-away message for policymakers: by far, the largest potential for persisting CO_2 emissions savings can be found in the transport sector, which accounts for most of the differences between the modelled scenarios. The study estimates that a persistent reduction in commuting and use of private cars can reduce total transport energy demand by 2025 to a similar extent as shifting 18% of private transport activity to public transport, or electrifying a third of global private road transport activity.

While the study projects the impacts of different recovery scenarios in much detail, it has nothing to say about their likelihood and how a green recovery could be facilitated. What remains completely unclear is which recovery pathways will dominate in reality, what the determining factors will be, and how far the recovery pathway can be influenced by policymakers. It remains to be seen how a green recovery can happen, allowing experiences from the COVID-19 pandemic to accelerate a transition towards a new energy system that will use a lot less energy for the same tasks. We also don't know how people can be prevented from reverting to their pre-pandemic behaviour. Answering these questions requires a different sort of analysis, which delves deeper into potential drivers and obstacles for green recovery pathways. Ideally, such research would try to simulate the potential impacts of specific policy instruments — something that is not yet possible with most integrated assessment models, but could yield fruitful results for designing successful green recovery policies[4]. However, the research by Kikstra et al. will go some way towards framing these behavioural questions in more concrete terms. ❐

Florian Knobloch ✉

Cambridge Centre for Environment, Energy and Natural Resource Governance, University of Cambridge, Cambridge, UK.

✉*e-mail: f.knobloch@cantab.net*

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Competing interests

The author declares no competing interests.