comment

A clean energy future isn't set in stone

Social scientists and geoscientists must work together to critically evaluate and develop feasible visions for a sustainable future. Is a clean-energy economy more viable than a degrowth future?

Thomas Franssen and Mandy de Wilde

Traditionally, geoscientists study the Earth while social scientists study the human societies that inhabit it. Many disciplines such as the climate and environmental sciences cross this divide and have worked hard to bridge the gap. Nevertheless, in our experience as social scientists, a divide between these sciences persists, with geoscientists and social scientists often working in separate departments, publishing in different journals and using distinct frameworks to understand how the world works. With human societies recognized as geological agents in their own right[1,2], responsible for global-scale changes of landscapes, climate and ecosystems, we argue that we need to further strengthen collaborations between the social sciences and geosciences, particularly when thinking about resource extraction, so that we can work together to ensure feasible and sustainable futures everywhere.

To address the massive anthropogenic changes to ecosystems and climate, some scientists and policymakers turn to an imagined future of a clean-energy economy. For example, Hoggard et al.[3] highlight an increasing demand for base metals to resource the transition to such an economy. The research rational is clear: the clean-energy economy requires widespread expansion of low-carbon technologies, for which minerals and metals will be needed. By emphasizing that reserves are currently used at a faster rate than new deposits are discovered, these geoscientists argue that improved techniques for locating ore deposits are required in order to meet demand. And so, the research problem is set: new deposits are not being discovered fast enough to meet demand. They tackle this challenge geoscientifically and explain why particular regions contain more mineral deposits than others, thereby helping the mining industry in their search for new deposits.

However, as social scientists, we question whether the imagined future of a clean-energy economy has been critically examined. We ask because this sociotechnical future[4,5] vision of a clean-energy economy is not undisputed. Here is our social scientific concern: would the geoscientific challenge be different if another vision of the future informed the study?

The vision of a clean-energy future originates in the framework of ecological modernization, which gained ground in environmental social sciences during the 1980s. Ecological modernization presents the growing pressure on the environment as a manufactured risk that results from industrial development. This risk can be thwarted by technological innovations that produce alternative industrial production and economic growth pathways. Ecomodernists therefore aim to decouple energy and resource use from socioeconomic advancement to foster a political economy that grows 'cleanly' and 'greenly'[6,7]. The idea of decoupling carbon dioxide emissions as well as resource use from socioeconomic advancement has also been cultivated in the climate and environmental sciences, and was highly influential in shaping the Paris Climate Agreement and the United Nations Sustainable Development Goals. Yet, in our view, we lack robust evidence that such a green growth strategy is viable.

Research on the feasibility of green growth draws on the gross domestic product (GDP) as a measure for economic growth, and investigates evidence of relative and absolute decoupling between GDP and carbon dioxide emissions and/or resource use. There is strong empirical evidence of relative decoupling between GDP and carbon dioxide emissions: a situation in which the growth rate of carbon dioxide emissions is lower than the growth rate of GDP[8]. But absolute decoupling, a situation of declining carbon dioxide emissions and growing GDP, is much harder to achieve[9,10]. Crucially, carbon dioxide emissions cannot feasibly be reduced to zero fast enough to stay within the carbon budgets of 1.5–2 °C global warming without relying on negative emissions technologies that have not yet been proven to work and while continuing to pursue economic growth[8]. As for the evidence of decoupling between resource use and GDP, in our view, these studies are even more pessimistic[8–10]. On a global scale, resource use has steadily increased in the twentieth century and while, for periods, GDP grew stronger, signalling relative decoupling, the twenty-first century showed a recoupling of resource use with GDP[8]. Although absolute decoupling might be achieved for some resources in some national contexts[9], at present there is no global trend in the direction of, nor viable scenario for, global decoupling of resource use from GDP[8,10].

Furthermore, the imagined clean-energy future envisions a transition to the widespread use of mineral-intensive, high-tech, low-carbon technologies[11]. Key to manufacturing these low-carbon technologies, such as electric vehicles and energy storage systems, are metals. Mining these metals comes with costs of environmental pollution and social disruption in the regions from which the minerals are extracted[12–14]. The production of low-carbon technologies raises ethical conundrums[11] such as local environmental degradation at the mining location for the clean, green socioeconomic advancement of the distant end-user. The clean-energy future does not represent a solution sustainable for all who inhabit this Earth.

While different futures are routinely considered in climate science, of the five Shared Socioeconomic Pathways in the Intergovernmental Panel on Climate Change future scenarios and projections, none imagine a no-growth or degrowth scenario[8,15]. However, the framework of degrowth[16,17], in which a steady-state economic system within Earth's limits is proposed, has gained ground in environmental social sciences since the 1970s. In our opinion, degrowth scientists convincingly argue against the concept of high-tech, low-carbon, green growth. Instead, they advocate for a future that does not require a shift from one extraction regime to another — from fossil fuels to minerals — but entails a transition to living under a different political and economic system with a radically smaller demand for resources[17]. Such a system champions low-tech technologies such as bicycles over high-tech technologies such as electric cars, and technologies are evaluated based on whether they allow for ecologically sustainable human–Earth relations everywhere, for instance, by being open source, durable and repairable[5,16]. Overall, the aim is to inhabit Earth while using less energy and with diminished demand upon its resources[17,18]. Just as we argue for critical evaluation of the clean-energy economy, an alternatively imagined degrowth future requires critical assessment of its feasibility, which will spark different and interesting questions and challenges along the way.

Both the social sciences and geosciences helped establish the extractive economies that cause the Anthropocene's ecological crises[19]. It is therefore incumbent upon all of us to avoid further exacerbation of these crises. Crucially, the sociotechnical futures that inspire and direct our research efforts should be debated from various disciplinary and stakeholder perspectives. Sustainability scholars[20,21] point to transdisciplinary research collaborations that bring together diverse disciplinary perspectives and societal stakeholders to co-produce new frameworks as a productive way forward. Such debates start by asking: what do our sociotechnical visions of the future share, and where do they clash? Who stands to benefit and at a cost to whom? Working through these questions will help us to develop new visions of sociotechnical futures that are sustainable as well as feasible. ❐

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