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The political economy of technical fixes: The (mis)alignment of clean fossil and political regimes

Nils Markusson[a,*], Mads Dahl Gjefsen[b], Jennie C. Stephens[c], David Tyfield[a]

[a] Lancaster University, Lancaster Environment Centre, Lancaster LA1 4YQ, UK
[b] University of Wisconsin-Madison, Robert F. & Jean E. Holtz Center for Science & Technology Studies, 1180 Observatory Drive, Madison, WI 53706, USA
[c] University of Vermont, 81 Carrigan Drive, Burlington, VT 05405, USA

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ABSTRACT

This paper argues that existing critiques of technical fixes are unable to explain our simultaneous enamourment and distrust with technical fixes, and that to do so, we need a political economy analysis. We develop a critical, theoretically grounded conceptualisation of technical fixes as imagined defensive spatio-temporal fixes of specific political economic regimes, and apply it to the case of geoengineering, or 'clean fossil', as an attempted technical fix of the climate change problem. We map the promises of clean fossil as a proposed solution to the problem of climate change in discrete episodes since the 1960s.

The paper shows that clean fossil promises have been surprisingly poorly aligned with the neoliberal regime, and explains how they have been moderately stable due to those misalignments. We also show that different liberal capitalisms could be supported by different clean fossil technologies, but also that illiberal or more egalitarian regimes remain possible alongside particular, perhaps radically re-envisioned, versions of clean fossil. Ambivalence towards clean fossil technical fix promises is intelligible, given the inherent instability of their co-evolution with neoliberalism and future political regimes.

1. Introduction

Technical fixes imply a use of 'the power of technology to solve problems that are nontechnical in nature' [1 p. 21]. This framing goes back to the mid-1960s, when Alvin M. Weinberg, physicist, made the case for technology's potential to offer cheap and effective solutions to problems ranging from population growth, poverty, energy needs, and water shortages [2]. Citing the difficulty of solving problems by influencing people's motivations and behaviour, Weinberg described technical fixes as 'cheap ... shortcuts' [2 p. 141] 'that are within the grasp of modern technology, and which would either eliminate the original social problem without requiring a change in the individual's social attitudes, or would so alter the problem as to make its resolution more feasible' [2 p. 9].

Weinberg's optimism about technical fixes was criticized even by contemporaries [3,4], and the term is rarely used with positive connotations today. Instead, technical fix has become a dismissive label for quick and cheap fixes that are 'partial, ineffective, unsuccessful, threatening, one-sided as opposed to holistic, mechanical as opposed to ecological' [3 p.3]. The phrase seems to indicate an improper problem bounding, where 'what is addressed is not the real problem but the problem in as far as it is amenable to technical solutions' [5 p. 152].

In public debates over science and technology, the 'technical fix criticism' is a rhetorical tactic in its own right [6]. For example, in the world of information and communication technology, 'technical fix' has become a stock accusation levied against product demonstrations where efficiency is only proved to the spectator by using a 'technology design framing that constructs organizational practices too narrowly' [7 p. 472]. This usage suggests that the limitations of technological naivety are obvious, and that public awareness of the political character of technology is well-established. Yet, an *enamourment-distrust paradox* remains. Despite consistent expressions of disillusionment, the popularity of promised technical fixes continues to demonstrate society's focus on technology when solving problems [3,6,8], and a sustained ambivalence about technical fixes.

We argue here that the existing literature on technical fixes is unable to explain satisfactorily this paradoxical resilience of technical fixes, and especially so in circumstances where fixes are seen to be both problematic in practical terms and normatively con-

Abbreviations: BECCS, bioenergy CCS; CCS, carbon dioxide capture and storage; CCUS, carbon dioxide capture, utilisation and storage; CDR, carbon dioxide removal; EOR, enhanced oil recovery; IPCC, Intergovernmental Panel on Climate Change; SRM, solar radiation management.

* Corresponding author.
E-mail addresses: n.markusson@lancaster.ac.uk (N. Markusson), madsdg@cantab.net (M. Dahl Gjefsen), jennie.stephens@uvm.edu (J.C. Stephens), d.tyfield@lancaster.ac.uk (D. Tyfield).

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tested. To explain this, we need an analytical framework capable of analysing what technical fixes *do*, practically, culturally and politically, as both promises and implemented systems. Specifically, the framework needs to be capable of explaining which fixes are supported, what interests they defend, and when they might work or fail. For this purpose, we develop a cultural political economy of science and technology framework drawing on Tyfield [9,10], and apply it to the empirical case of geoengineering as a technical fix to the climate change problem.

Climate change first emerged as a policy concern in the 1960s, soon followed by proposals for engineering solutions that would allow us to preserve our fossil fuel-based society [11–14]. Since then, geoengineering, or 'clean fossil', in various forms has remained a part of climate policy. In the 1960s and 1970s, two technical approaches were discussed: (1) changing the reflectivity of the planet (today referred to as solar radiation management, SRM), and (2) sequestering CO_2 (currently referred to as carbon dioxide removal, CDR). From the 1990s, capture of CO_2 from large point sources – especially fossil fuelled power plants – and subsequent sequestration in geological formations (carbon dioxide capture and storage, CCS) was the most prominent technical fix promise. In the last 15 years, the term geoengineering, defined to include all clean fossil apart from CCS, has been used to frame a revived interest in several other geoengineering technologies, cf. Fig. 1.

We include geoengineering technologies in the category of 'clean fossil' because the promise of geoengineering is precisely to come to the rescue when fossil fuel based emissions prove hard to avoid. Notable exclusions from the category include renewables, which are disruptive to fossil fuel use, and more efficient power plants, which are merely incrementally cleaner than existing technology.

Whilst there have been research and a few demonstration projects for some technology variants (including several CCS demonstration plants), overall clean fossil remains unimplemented. There is, however, a range of active technology specific research and development communities [15–17], with varying levels of industry and state involvement, and actors who are interested in geoengineering as a whole. While the communities around CCS and geoengineering are distinct, some actors (including researchers like ourselves) have overlapping interest in both areas [18–21].

Geoengineering is a technical fix *par excellence*, calling on technological solutions to complex (socio-environmental) problems on an unprecedented, planetary scale in ways that would profoundly – and deliberately – redefine our relationship with, and position in, the Earth system as one of human technological mastery [22,23]. Clean fossil technologies have been analysed (and critiqued) as a technical fix before. For example, Sarewitz and Nelson [24] argue that air capture technology is a better technical fix than CCS, for a set of practical reasons. Scott [25] argues that geoengineering as a technical fix is ethically problematic, in terms of who gets to set criteria for success, and for reinforcing a norm that humans should dominate nature. Corner and Pidgeon [26] warn that geoengineering as a potentially quick and cheap technical fix has the potential to mobilise economic and ideological interests, and so distract from more expensive mitigation. However, none of these authors analyses the political economy of clean fossil in any detail.

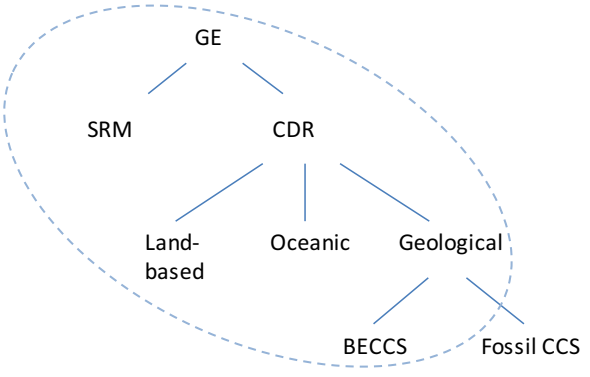

Fig. 1. The different categories of clean fossil technology. The dashed line signifies geoengineering (GE). BECCS = CCS on bioenergy fuelled power plant.

Clean fossil illustrates the role technical fixes play in the evolution of political regimes. Tyfield [10] has shown how coal-dominated CCS technology (and our continued underlying reliance on coal, notwithstanding recent bankruptcies and turmoil in the coal industry [27,28]) fits badly with the oil-based [29] neoliberal regime, even as it appears, prima facie, to align perfectly. It promises to clean up fossil based society whilst leaving our lifestyles and production systems more or less intact, and it promises to do so mediated by neoliberal policy based on emissions markets that match emissions with sinks (or warming with cooling) at the lowest possible cost. Yet, paradoxically, CCS continues to struggle, with just one plant attached to fossil-fuelled electricity generation currently in operation, out of approximately 1500 plants that the International Energy Agency estimates are needed; and with that one also facing significant difficulties [30].

Neoliberalism is here defined as the unlimited faith in the capacity of markets to solve the problems involved in governing human affairs [31]. This means that within neoliberalism there is no way of conceiving of existential threats that are unamenable to market-based solutions. Carbon trading can handle climate change only if it is seen not as an irreducible and existential 'threat' that simply must be avoided as a whole, but as a phenomenon that is at least sufficiently malleable and amenable to market-based socio-technical intervention as to be manageable (i.e. optimizable) on that basis, i.e. as being merely a 'risk' [31]. Risks are calculable, manageable by markets and so 'knowable' (i.e. by what the market subsequently makes manifest as the case) under neoliberalism. But threats cannot be thus mitigated and are not calculable and manageable by markets. Instead threats require limits set to the freedom of markets on the basis of *other*, non-market knowledgeable judgements and executed by non-market forces, notably government. CCS implementation requires long-term planning of infrastructure and investments in large demonstration plants without hope of short-term profit – a poor fit with the incremental, nimble, short-term (and financialized) investments favoured by markets. CCS might therefore do better under other political regimes that are better equipped to deal with existential threats through forms of state planning.

This paper extends Tyfield's analysis of CCS to all of clean fossil. Whilst clean fossil was first conceived during the peak of the social liberal political regime in the 1960s (what Jessop [32] defines as the Keynesian national welfare-warfare state regime), it was after the breakthrough of neoliberal [31] policy making in the 1980s and the later formulation of early climate policies that the promise of clean fossil, then in the form of CCS, became prominent in the 1990s. Mounting environmental and financial challenges to neoliberalism over the last decade has coincided with growing interest in geoengineering. Malm [33] argues that in an economy based on and committed to production and consumption of fossil fuels, and where current political regimes are neither channelling enough capital to renewables nor willing to phase out fossil fuel use, we are faced with a choice of planning either the climate or the economy. Geoengineering thus promises to defend fossil interests, including many of the world's largest companies and the wider fossil fuel dominated economy. Geoengineering has therefore been attractive also to former climate sceptics and a range of conservative lobbyists otherwise unsupportive of energy system changes [34].