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Critical theory of the energy transformation: sociology's approach

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ABSTRACT: This article explores the critical theory of energy transformation within sociology, aiming to understand and enhance societal change. It investigates the shift from fossil fuels to renewable energy sources, analysing the socio-economic and geopolitical implications. Using empirical data, it reveals disparities between public discourse and actual emissions, unmasking power asymmetries and 'green colonialism' perpetuated by dominant nations and corporations. The study underscores the need for profound societal transformation rather than superficial energy shifts, advocating for the fusion of critical theory and capitalist critiques. It emphasises the importance of dismantling hegemonic control and fostering equitable energy transformation, calling for civic courage to challenge existing power structures. This work's originality lies in integrating critical theory within sociology, offering insights into the socio-political dynamics influencing global decarbonisation efforts. Its value resides in a comprehensive analysis, unveiling interconnections between power, economics, and the environment in the context of energy transformation.
KEYWORDS: energy transformation, critical theory, critical sociology, geopolitical implications, green colonialism, power asymmetries

> The praxis of critical sociology is to understand and enhance the basis of social transformation.
>
> Sallach (1973, p. 137)

INTRODUCTION

The energy transformation is sometimes referred to as 'energy transition' (Gielen et al., 2019), although the latter term exclusively pertains to the process of changes *within* the energy system using technical (or, more specifically, socio-technical) means and of a gradual nature. On the other hand, energy transformation implies a fundamental change of *the entire* energy system and is of a fundamental nature. In

neutral terms, the transformation of the energy system denotes the comprehensive process of converting energy from one form to another (energy conversion). In contrast, nowadays, it is about decarbonisation, which involves substituting fossil fuels with renewable energy sources (RES) (Afonso, Marques, & Fuinhas, 2021). The necessity to develop zero-carbon solutions is linked to the ongoing climate changes, which entail modifications in the climate system, an integral part of the natural environment. When considering energy transformation, it is essential to remember that the climate system comprises the atmosphere, hydrosphere, lithosphere, cryosphere and biosphere (Steffen et al., 2020). This complex and interlinked system takes precedence over the energy system (Reid et al., 2010), although this does not imply that changes within the latter are insignificant (Castree et al., 2014; Steffen et al., 2015). Figure 1 illustrates the interrelation between the natural environment, climate, and human activity, with the latter progressively exerting a more significant influence on climate change (Behrensmeyer, 2006; Goudie, 2018).

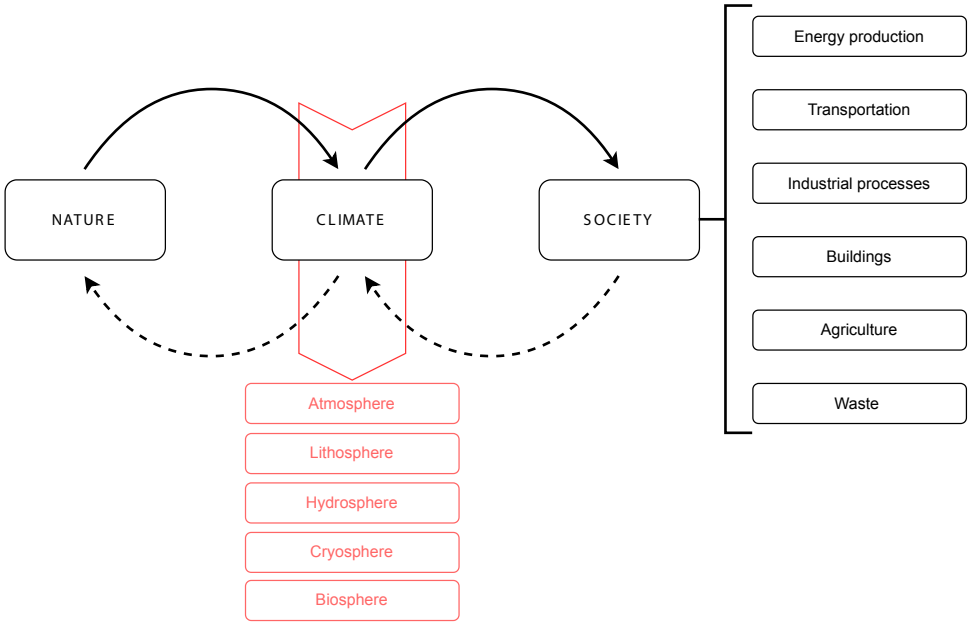


Figure 1. Climate transformation
Source: Author's own elaboration

The awareness of the interdependence of the natural and human systems is not subject to debate nowadays, except for marginal and unsupported by scientific research voices advocating for nonrenewable energy, embodied by—horror of horrors—COP28 President and United Arab Emirates climate chief Sultan al-Jaber. It was he who 'famously' claimed at the COP28 summit in December 2023 that there is 'no science' behind calls for a phase out of fossil fuels (Meredith, 2023). Even the economically liberal *The Economist* (2023) noted that "The choice of the summit's host country—the United Arab Emirates, one of the world's leading petrostates—and its chairman, Sultan al-Jaber, the head of its national oil company, threatened to turn the event into a giant exercise in greenwashing".

Research on energy transformation should not ignore such voices, as the momen-

tousness of the consequences of this radical change in energy regimes translates directly into the new geopolitical world order (Hafner & Tagliapietra, 2020). In the forthcoming energy transformation, the welfare of many nations (Baranowski, Cichocki, & McKinley, 2023) built upon extractivism will be significantly disrupted. Yet, new opportunities will also arise for previously marginalised societies. This also applies to large corporations, entire economic sectors and industries, regardless of ownership structure. Obstacles to energy transformation arise and will continue to emerge in less apparent areas (consumers, marginalised groups, social environmental movements), using different arguments to support their positions. Nevertheless, the vast and continuously increasing environmental pollution caused by humans is referred to as the Anthropocene (Crutzen, 2006; Lewis & Maslin, 2015) or, as some argue, the Capitalocene (Moore, 2017, 2018) or Homogenocene (Curnutt, 2000; Preston, 2019), is a reality. Over 73% of global greenhouse gas emissions are caused by the energy sector (see Figure 2), which is why we need a critical theory of energy transformation that highlights the significant aspects of the decarbonisation process. Efforts, both sincere and superficial, aiming to achieve net-zero greenhouse gas emissions globally by 2050 fail to yield the expected results, while obstacles multiply at an alarming rate and in a daunting manner (Baranowski, 2022a, 2022b, 2023; Hess, McKane, & Pietzryk, 2022; Kammen, Yoshikawa, & Yamaguchi, 2023; Klitkou, Pluciński, Baranowski, & Otto, 2023).

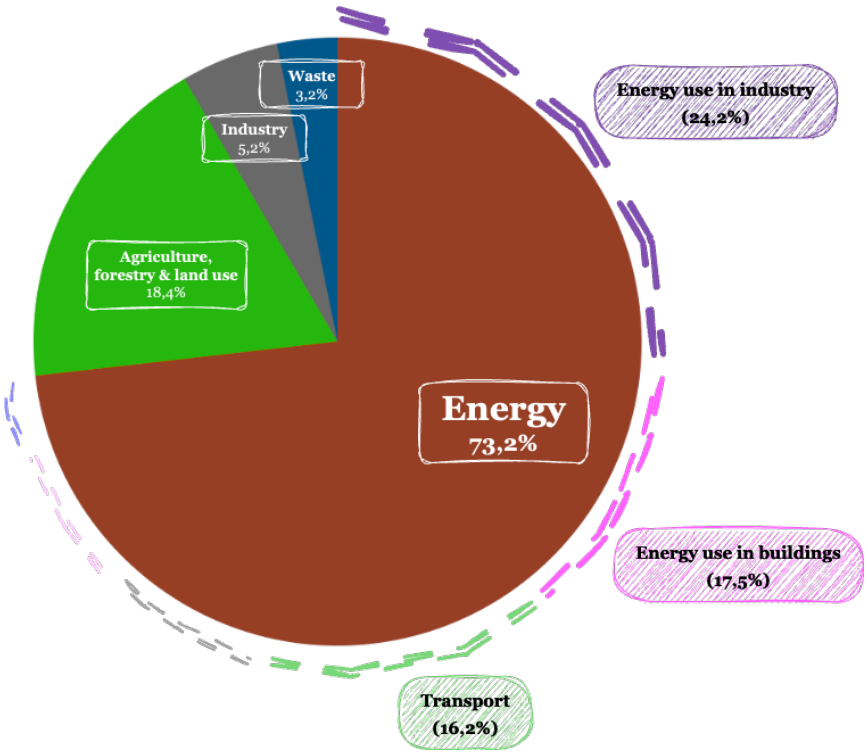


Figure 2. Global greenhouse gas emissions by sector
Source: Author's own elaboration based on cited by Ritchie (2020)

Within the energy sector itself, the largest share of CO_2 emissions is generated by energy use in industry (24.2%), buildings (17.5%), and transportation (16.2%). Regarding energy usage within the industry, the most emissions-intensive sectors are Iron

and steel (7.2%) and Chemical and petrochemical (3.6%). In buildings, emissions are predominantly associated with Residential buildings (10.9%) and Commercial (6.6%), while in transportation, Road transport (11.9%) surpasses Aviation (1.9%) and Shipping (1.7%) in emissions. Considering these proportions is crucial for identifying material (the logic of corporate profit-making) and, intertwined with them, ideological (science and political power) barriers to the effective implementation of energy transformation aimed at achieving climate neutrality. It is of utmost significance in the context of research findings on the long-term effects of the persistence of CO_2 in the atmosphere (Inman, 2008).

CRITICAL THEORY AS CRITICAL SOCIOLOGY

In his 1937 essay, Max Horkheimer stated that "the critical theory of society (...) begins with abstract determinations; in dealing with the present era, it begins with the characterisation of an economy based on exchange" (Horkheimer, 1972, p. 225). Although the German scholar focused on developing the foundations of critical theory within the cultural dimension of the expansion of fascist totalitarianism, this approach can be useful for analysing climate change or one of its aspects, such as energy transformation. Mainly because "'critical theory' and 'critical sociology' are defined as that social scientific approach which has at its core the concept of 'critique'"(Sallach, 1973, p. 132). And this critique is essential for considering the context of the development and maintenance of fossil fuel-based technologies, which *nota bene* are closely linked to an economy based on exchange. The dominant model of the neoliberal capitalist economy, which commodifies nature in pursuit of profit (Ziółkowski, Baranowski, & Drozdowski, 2020), is based on extractivism and appropriation of raw materials, natural goods and labour worldwide (with a particular focus on the Global South) (cf. Bringel & Svampa, 2023, p. 29).

As the foundations of the Frankfurt School stem from Marx's critique of socio-economic relations in capitalism, which are based on domination, the critical theory itself aims to uncover and radically challenge these relations. After all, the ultimate goal is not merely to interpret the world, but to change it (cf. Marx & Engels, 1998).

This perspective fits remarkably well with the characteristics of the energy transformation, as the latter requires a thorough critique of past facade moves that only pretended to move towards zero-emission carbon economies. One form of 'pretence' is scenarios of a brave new world in which technological innovations make it possible to increase energy demand without fundamentally changing social, economic, political or environmental relations. Another involves rationalisations of the existing relations of domination of the North over the South employing wonderful-sounding concepts of sustainable development or a just energy transition. Yet another is the lack of a holistic perspective in approaching the energy transformation as a part of a broader socio-ecological transformation as if the nature/climate components were independent entities. Not only are these components closely interconnected (Nesterova, 2023), but—more importantly, in the context of the social consequences of maintaining economies based on fossil fuels—they have tangible negative implications in

the short term for the overall health of entire populations (Huang et al., 2014; Kampa & Castanas, 2008; Whitmee et al., 2015) and, in the long term, for the state of nature as a whole, upon which the fate of humanity depends (Denkenberger & Pearce, 2015; Howard, 2022; Zhang et al., 2011). The fundamental role of critical theory applied to energy transformation is to reveal the factual assumptions of this radical change in its actual form, i.e., based on the economic-military power of the core states of the capitalist system. When we look at this significant yet instrumentally treated process of decarbonisation in this way, we will notice the hypocrisy of the wealthiest global economies with their instruments of green extractivism (Voskoboynik & Andreucci, 2021), green colonialism (Normann, 2021), climate commodification (Lohmann, 2012) and financialisation (Sullivan, 2013; Xie & Cheng, 2021), or green grabbing (Hamouchène, 2023). We will also notice global players in the form of, among others, the most powerful states (such as the USA or China), their organised forms (such as the European Union), or financial super-institutions (such as the World Bank or the International Monetary Fund). All of them use the politics of fear, and behind them stand the most powerful tools for enforcing obedience. Critical theory is intended to serve their reliable explication.

A FISH ROTS FROM THE HEAD DOWN

Facing the decarbonisation challenge, it is crucial to clearly underline who is responsible for the highest CO_2 emissions, ensuring that specific institutional solutions are adequately formulated and implemented. This identification is not only essential for tailored institutional approaches but also to ensure that these solutions reflect the proportionality of actions necessary for carbon neutrality due to the scale of carbon dioxide emissions into the atmosphere.

From a historical perspective, the United States stands out as the largest emitter of CO_2, significantly surpassing China, Russia, Germany, and the United Kingdom in this unfavourable ranking (Figure 3). In this comparison, apart from the apparent dominance of the USA, there is also evident superiority of the most developed economies over the developing ones. This should delineate the proportion of burdens associated with the costs of energy transformation (Shue, 2017).

In the current scenario, the largest emitter of carbon dioxide is China (27% of global emissions), followed by the United States (15%) and the European Union (9.8%). When considering continents, Asia leads significantly with 53% emissions, ahead of North America (18%) and Europe (17%). Interestingly, the combined contribution of all African countries is merely 3.7% of global emissions, while South America contributes 3.2%, and Oceania 1.3% (*Global Carbon Project*, 2023).

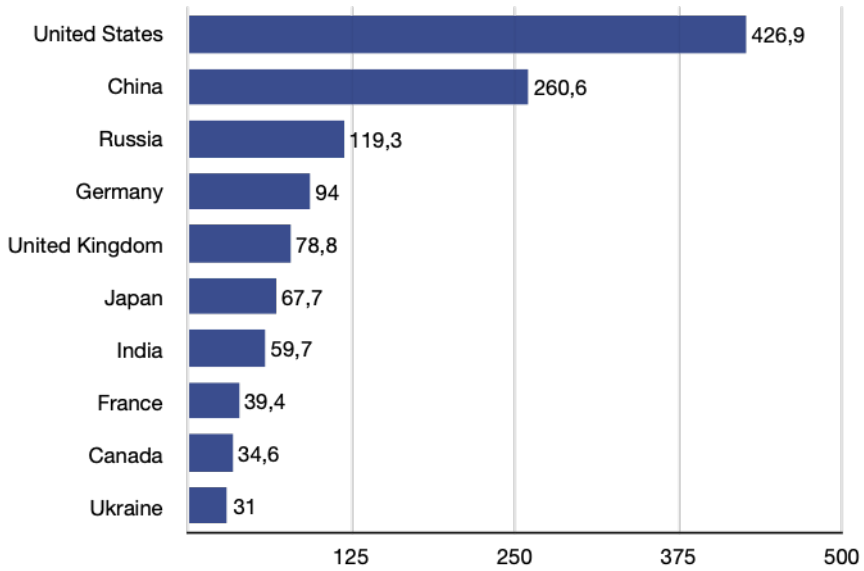


Figure 3. Cumulative carbon dioxide (CO2) emissions from fossil fuel combustion worldwide from 1750 to 2022, by major country (in billion metric tons)
Source: Author's own elaboration based on Statista (2023)

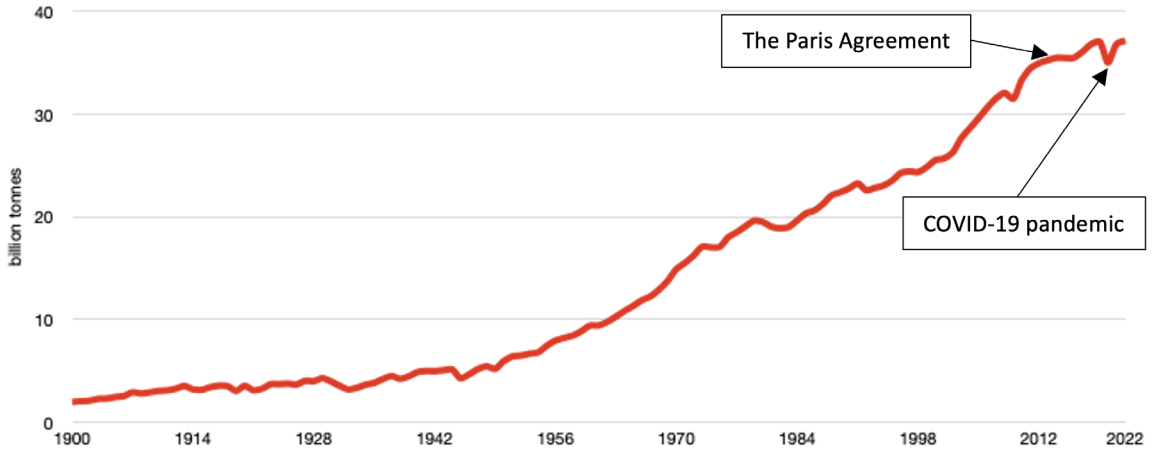
The quoted data leaves no illusions about which countries bear the primary responsibility for global CO_2 emissions, considering both historical measurements and current statistics (although more nuanced approaches present specific adjustments, cf. Y. Liu, Jayanthakumaran, and Neri (2013)). On one hand, this translates into the moral dimension of moving towards a low- or zero-carbon transformation. On the other hand, it involves the pragmatic challenge of compelling these countries to take responsibility for a demanding and high-cost process. This is particularly complex when considering the position of these states within the geopolitical system of dependencies. However, the role of critical theory is to reveal, criticise, and challenge power structures and dependencies, as well as any form of injustice, which are essential elements in the transformation of reality.

DISCOURSES AND REALITIES ON ENERGY TRANSFORMATION

Alongside declarations and expressed concern about the pressing issue of global warming and the role energy systems play in it, public statistics do not show a translation of the proudly voiced climate concerns into tangible outcomes. Figures 4 and 5 depict data on annual carbon dioxide emissions over the last one hundred twenty-two years. Apart from the year 2020, which was affected by the COVID-19 pandemic, there has been no radical change in this crucial aspect of mitigating climate change.

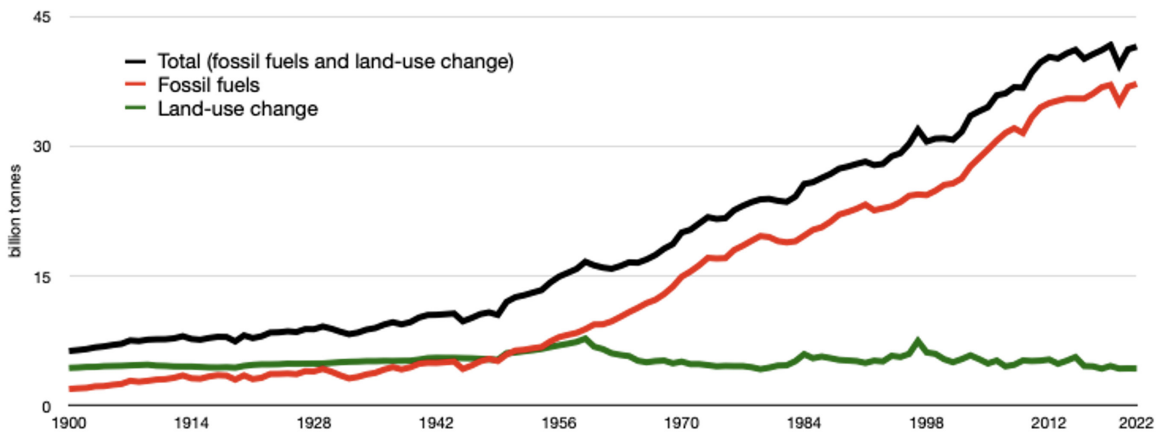
Figure 5 shows a distinction between CO_2 emissions from fossil fuels and land-use changes. Additionally, the black line represents the combined total of these two. It is evident that since the 1960s, fossil fuels have constituted a critical and, regrettably, dynamically growing issue concerning carbon dioxide emissions into the atmosphere. Paradoxically, the period of the COVID-19 pandemic and the accompanying lockdowns demonstrated that radical change is feasible (Pagani, Fortunati, & Farino-

si, 2023). Even if, in this case, we are discussing a forced necessity for the protection of human health and life, these dramatic experiences nonetheless showcased potential avenues for change (Z. Liu et al., 2020; Nguyen, Hoang, Ölçer, & Huynh, 2021) and even revealed immediate impacts on the natural environment (Bates et al., 2021; Chakraborty et al., 2021).



* Carbon dioxide (CO2) emissions from fossil fuels and industry (in billion tonnes)

Figure 4. Annual CO2 emissions from 1900 to 2022
Source: Author's own elaboration based on (*Global Carbon Budget*, 2023)



* Carbon dioxide (CO2) emissions from fossil fuels and industry (in billion tonnes)

Figure 5. CO2 emissions from fossil fuels and land-use from 1900 to 2022
Source: Author's own elaboration based on *Global Carbon Budget* 2023)

In practice, however, with the containment of the COVID-19 pandemic, the situation swiftly reverted to the previous state of high CO_2 emissions. Simultaneously, when applying critical social theory to energy transformation, one cannot overlook the aforementioned empirical data (Figure 3 and beyond) in light of unequal and often concealed power relations within the global system. A poignant example is the *Manifesto from the People of the South: For an ecosocial energy transition* (*Pacto Ecosociale e Intercultural del Sur*). It draws attention to how "an energy transition led by corporate

megaprojects from the Global North and accepted by numerous governments in the Global South entails the enlargement of the zones of sacrifice throughout the Global South, and the persistence of the colonial legacy, patriarchy, and the debt trap" (*Manifesto from the People of the South: For an ecosocial energy transitio*n, 2023, pp. 39-40).

National and corporate policies, as well as PR documents, entirely omit mention of deeply unjust and disguised strategies, which we can define as "decarbonisation of the rich", "which is market-based and export-oriented, depends on a new phase of environmental despoliation of the Global South, which affects the lives of millions of women, men, and children, not to mention non-human life" (*Manifesto from the People of the South: For an ecosocial energy transition*, 2023, p. 39). This "green extractivism" or "energy colonialism" essentially marks "a new dynamic of capitalist extraction and appropriation of raw materials, natural goods and labour, especially in the Global South (though not exclusively), for the green energy transition" (Bringel & Svampa, 2023, p. 29). This implies that countries of the Global North and their corporations, on one hand, relocate dirty industries to euphemistically termed "pollution havens" (Mani & Wheeler, 1998), and on the other hand, increase the share of renewable energy sources in their energy mixes by appropriating rare earth minerals. Moreover, in their deceitful practices, which can be termed as business strategies for corporations and environmental policies for countries (Martínez, 2023; Streeck, 2023), the states of the Global North have gone even further. Let the following passage serve as an example:

> The role of France, a country that maintains a strict colonial grip on Francophone nations in Africa, is especially interesting. While it has outlawed fracking and crude oil extraction in its territories and has also banned fossil fuel advertisements, its oil and gas behemoth, TotalEnergies, continues to extract elsewhere and most notoriously at Cabo Delgado, Mozambique, from where the first shipment of fossil gas took place as COP27 was happening in Sharm El Sheikh. The timing of the first shipment illustrates how violence has not stopped resource extraction in Africa, as they often go hand in hand. This is epitomised by cases of blood diamonds of Liberia and the ongoing instability in the Democratic Republic of Congo. (Bassey, 2023, p. 37)

CONCLUSIONS

Critical sociology's contribution to the global fight against climate change through energy transformation should primarily entail breaking away from what Max Horkheimer and Theodor W. Adorno (2002, p. 65) described as "the form of knowledge which (...) most effectively assists the subject in mastering nature". The project of mastering nature has proved to be as equally effective as it has been, apart from its evident historical benefits for humankind, tragically impactful. In the current context, social sciences utilising critical theory are tasked with bolstering the energy transformation project by identifying, critiquing, and challenging its weaknesses (cf. Diamanti & Szeman, 2020).

Mitigating the negative consequences of CO_2 emissions as a byproduct of fossil fuel energy production, a thoughtful transformation of the energy system must break away from the mistaken belief that "civilisation is the triumph of society over nature" (Horkheimer & Adorno, 2002, p. 153). In doing so, this attempt at radical change will face concerted attacks from various interest groups promoting hydrocarbons and nuclear energy because the energy transformation essentially implies a reshaping of the "geopolitics of the twenty-first century" (Sachs, 2020, p. v). Therefore, as I have illustrated above, particularly the wealthiest countries of the Global North will not hesitate to use their economic-military solid position to impose new forms of dependency on the weaker nations of the Global South in the guise of green colonialism or green extractivism.

Exploration into the social dimensions of energy transformation necessitates a fusion of critical theory of society, inherently encompassing its political dimensions, and an examination grounded in theories of capitalism. This fusion is pivotal in preventing the transformation from being a mere superficial change, resembling what Horkheimer & Adorno (1972, p. 9) described as "sociology without society". Most crucially, it demands civic courage to unveil the obscured mechanisms of power and the vested interests of what Adam Smith referred to as 'the masters of mankind'. This was emphasised by activists from the Global South in their manifesto, addressing not only the "new forms of energy colonialism" impacting their countries but also highlighting the "hypocritical discourse of the European Union, which recently declared natural gas and nuclear energy to be 'clean energies'" (*Manifesto from the People of the South: For an ecosocial energy transition*, 2023, p. 40). To put it briefly, the role of critical social theory is precisely to continuously expose any form of power asymmetry on a global and domestic scale, as well as to challenge the overrated, so-called 'techno-market fixes' promises of low-carbon solutions that would allow us to curb CO_2 emissions without any sacrifices.

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