The multidimensional co-benefits and injustices of low carbon transitions in Europe

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EXTENDED ABSTRACT

In this study, based on a mixed methods approach, we catalogue 128 prospective co-benefits to four European low carbon transitions. This includes 30 co-benefits for French nuclear power, 30 co-benefits for German solar photovoltaics (PV), 26 co-benefits for Norwegian electric vehicles (EVs), and 42 co-benefits for smart meters in Great Britain. Tellingly, 37 of these collective benefits are identified as economic and 14 environmental, but the remaining ones illustrate a broader spectrum of technical, social, and political benefits (77 in total).

Introduction / background

The paper and presentation explores the myriad potential benefits of four low-carbon transitions beyond those in the environmental or economic domain. Drawn from a rich set of original mixed methods data—across expert interviews, focus groups, and public internet forums—we examine the presumed multidimensional, qualitative co-benefits to nuclear power in France, solar photovoltaics in Germany, electric vehicles in Norway, and smart meters in Great Britain. We catalogue 128 identified prospective co-benefits to these four European low-carbon transitions, 30 for nuclear power, 30 for solar photovoltaic panels, 26 for electric vehicles and 42 for smart meters. Tellingly, 37 of these collective benefits are identified as economic and 14 environmental, but the remaining ones illustrate a broader spectrum of technical benefits (31 in total), social benefits (30 in total) and political benefits (16 in total). After presenting this body of evidence, the paper then discusses these benefits more deeply in terms of complementarity, temporality, scale, actors, and incumbency. We conclude with insights for energy and climate research and policy more broadly.

Methodology

We proceeded with a qualitative research design that mixed methods across three approaches: semi-structured research interviews with experts, to obtain expert opinion; five focus groups in non-capital areas, to obtain public opinion; and the monitoring of twelve internet forums (three per country), to solicit public opinion beyond the somewhat limited scope of the focus groups. We conducted 64 interviews, 16 per country, and sought to obtain a diverse mix of data from across academic institutions, non-profit organizations and civil society groups, government departments (including independent regulators), think tanks, and industry (including trade bodies and financial institutions) in the summer and fall of 2018 (see the data tables in Appendix I). In each interview, we asked (among other questions): "What do you see as the most significant benefits or advantages to the energy transition being examined?" The research interviews generally lasted between thirty and ninety minutes, were digitally recorded, and participants were guaranteed anonymity to protect their identity and encourage candor. To supplement our expert interviews with public perceptions, we conducted five focus groups in non-capital areas of each country, namely Lewes (GB), Colmar (France), Freiburg (Germany), and Stavanger (Norway) with a total of 15 participants, summarized also in Appendix I. The justification for focus groups was to solicit input from non-expert stakeholders, given that focus groups and interviews work well together, but are not substitutes.

Interviews tend to reveal more private, in-depth opinions, whereas focus groups reveal more public attitudes and consensus values (Kaplowitz and Hoehn 2001; Gailing and Naumann 2018). Admittedly, our focus groups were on the small side, with two to six participants each, whereas Citizens Advice (2015) suggests an optimal size of 6 to 8 respondents and O'Nyumba et al. (2018) report a common size of 3 to 21 participants. However, Morgan (2012) emphasizes in particular the value of smaller 2 to 3 person focus groups, for being more intimate and having a better group dynamic, which we certainly found to be the case in our research design and implementation. Lastly, to triangulate our interviews and focus groups, we posted research questions on online internet forums, three per country, to solicit public input beyond the focus groups. Collectively, these forums had almost 2.1 million members that we could identify (see Appendix I for more details). For each case study, we asked: "What are the biggest advantages of low carbon innovations such as smart meters, EVs, solar PV, or nuclear? Who are the big recipients of those benefits or winners?" This resulted in 58 additional responses

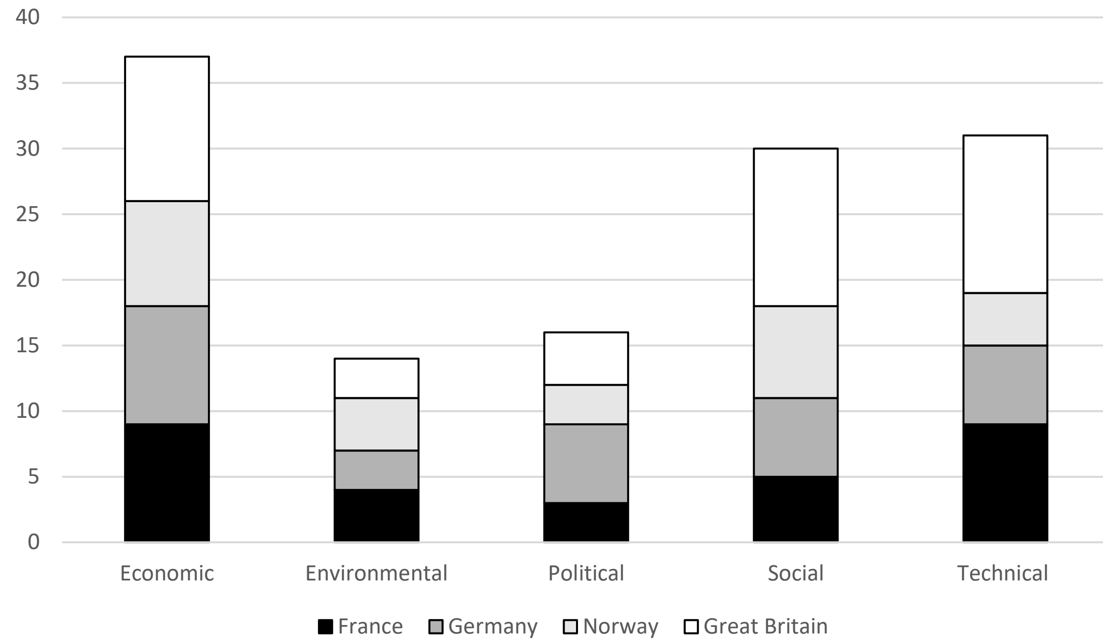
Results

Overall, our mixed methods results produced a total of 128 benefits that we inductively placed in technical, economic, political, social, and environmental dimensions. By technical, we refer to benefits such as efficiency and performance improvements, innovation dynamics, and knowledge and skills development. By economic, we refer to benefits including affordable energy services, revenues for stakeholders (including users and investors), and jobs. By political, we refer to benefits such as policy learning, enhanced energy security, and building political capital via meeting campaign pledges and promises. By social, we refer to improvements in comfort, prestige, identity, awareness, and lifestyle. By environmental, we mean benefits in terms of reduced air pollution, mitigation of emissions, water, and other aspects of the natural world.

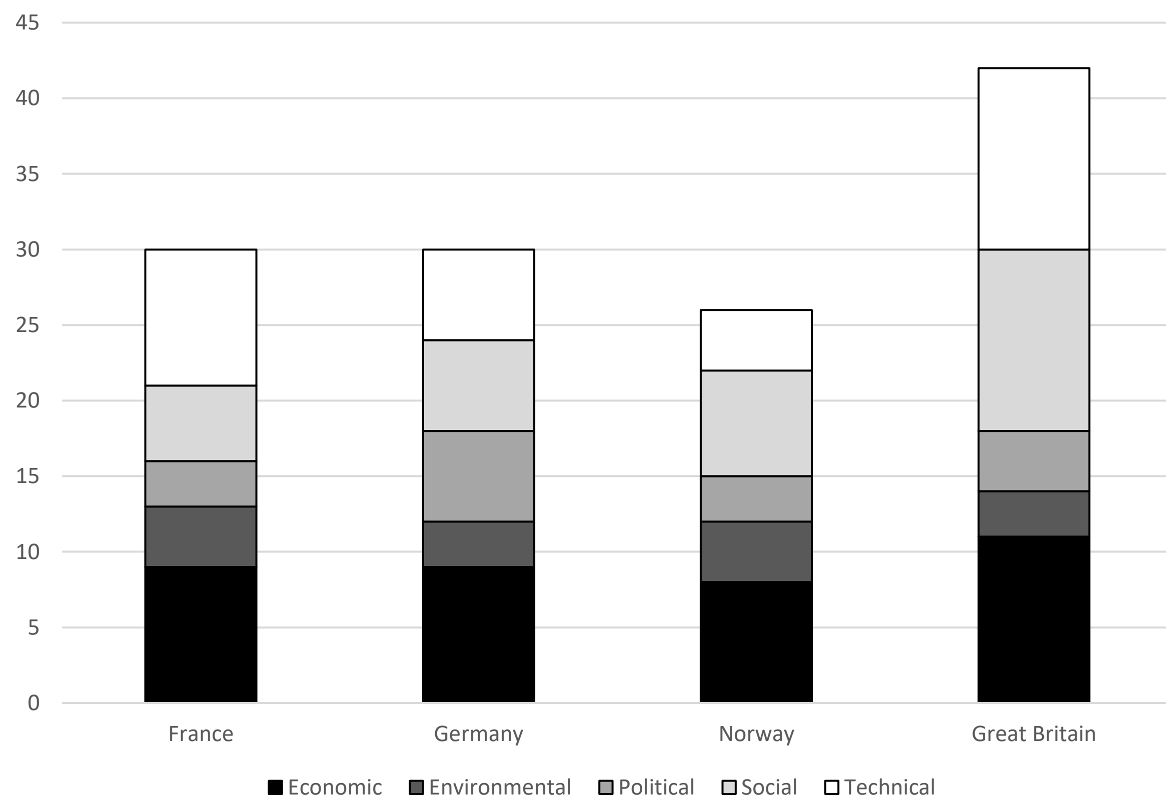
As Figure 1 summarizes, a significant number of these were economic (37), such as fuel savings, jobs, exports, and profits. Others were environmental (14), such as displaced air pollution, mitigated climate change, reduced land use impacts, and other avoided externalities. But apart from these, our remaining 77 co-benefits do not fall into these broad categories of "cost" and "carbon." We captured 30 social benefits, as diverse as the way in which nuclear power galvanized national pride in France to the way in which electric vehicles elicited positive feelings of prestige and environmental consciousness in Norway. We captured 31 technical benefits, from the ways in which smart meters are facilitating distributed generation in Great Britain to the ways in which PV stimulated innovations in solar PV technology in Germany. We captured 16 political benefits, from policy learning across all four cases, as well as improvements to energy security and reduced energy dependence in all four cases. As Figure 7 also illustrates, when the data is transposed by country, Great Britain had the most potential co-benefits identified (42) followed by France (30) and Germany (30) with Norway (26) at the bottom. in mind, we offer three conclusions.

Figure 1: Summary of the 128 co-benefits to low carbon transitions by dimension and country

a. *Top panel: by co-benefit*



b. Bottom panel: by country



Source: Authors

Conclusion & discussions

First, for the energy studies and energy economics communities, we may need more sophisticated modeling, policy analysis, and even research designs that are capable of understanding and capturing the non-environmental and non-economic aspects of low carbon innovation. This holds especially true for social and political co-benefits, such as national pride (France), energy democracy (Germany), greater environmental consciousness (Norway), or feelings of comfort and convenience (Great Britain). Capturing these profuse, and at times obscure, co-benefits is especially important for the more difficult-to-predict (or quantify) dimensions, such as those relating to social and political processes. This finding becomes even more salient when such co-benefits have varying temporal timeframes, spatial scales, actors, and effects on incumbency and democracy. As such, we confirm the findings arising from Ürge-Vorsatz et al. (2014) and Bhardwaj et al. (2019), that the analysis of co-benefits, or energy and climate policy, demands a multiple-objective and multiple-impact framework.

Secondly, the complementarity and interoperability of innovations implies that transitions may gain momentum when multiple innovations are linked together in ways that improve their functionality or their ability to reconfigure entire systems. The implication here is that future low carbon transitions may require complementary innovations across an array of technologies, including energy storage or smart meters. Such complementarity of innovations suggests the need to move beyond analyzing individual technologies to entire systems. Indeed, it is not possible to fully distinguish the national versus technology differences across our four case studies because we only analyzed one technology per country, rather than the same technology across all four countries, or all four technologies across all four countries.

Thirdly, looking across these four transitions as a whole, our results pose methodological questions for low carbon energy transition research generally. Our findings, even though they are qualitative in nature, indicate that simple research designs (or policy mixes) that typically center on examining relationships between dependent and independent variables in order to develop generalizable laws may be inadequate in capturing the empirical complexity and multidimensionality of the transitions themselves. Certainly, rather than attempting to narrowly identify an omniscient causal relationship in any of our transitions that could yield the types of co-benefits we identify, our findings suggest that it may be more fruitful to search rather for combinations of multiple causal mechanisms and conjunctions between event chains (Ragin 2008). Analysts and policymakers should therefore aim to look beyond carbon pricing, and exclusively economic or environmental benefits, instruments, and institutions. Instead, they must recognize—and perhaps even celebrate—that low carbon transitions are ultimately processes that are as entangled in social affairs, political events, and technical innovation dynamics as they are in environmental and economic domains.