

Net zero in the primary healthcare sector: Navigating institutional, organizational and individual level challenges of decarbonising general practice

Frederik Dahlmann, University of Warwick (Primary Presenter)
frederik.dahlmann@wbs.ac.uk

Florence Karaba, University of Warwick
florence.stadler@warwick.ac.uk

Helen Atherton, University of Southampton
h.atherton@soton.ac.uk

Abi Eccles, University of Oxford
abi.eccles@phc.ox.ac.uk

Olivia Geddes, University of Warwick
olivia.geddes@warwick.ac.uk

Michael Gregg, PPI Representative
mpgregg@blueyonder.co.uk

Sue Jowett, University of Birmingham
s.jowett@bham.ac.uk

Ana Raquel Nunes, University of Warwick
raquel.nunes@warwick.ac.uk

Rachel Spencer, University of Warwick
r.spencer.2@warwick.ac.uk

Nicky Thomas, University of Warwick
nicky.thomas.1@warwick.ac.uk

Helen Twohig, Keele University
h.j.twohig1@keele.ac.uk

Jeremy Dale, University of Warwick
jeremy.dale@warwick.ac.uk

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Abstract

General practice plays a critical role in the NHS' effort to mitigate the environmental impact. Prior research has pointed to the role of general practitioners as health advocates, role models and sources of information pertaining to climate change by raising awareness of its impact on human health. However, climate change initiatives require personal effort, behavioural change, organizational leadership as well as institutional and policy support to succeed.

Building on extant insights from management and healthcare literature and drawing on the combined empirical findings from a large, multi-year and multi-study research project set in the UK, here we develop an integrative framework of the factors shaping decarbonisation in general practice. More specifically, we seek to model the systemic nature collectively characterising the drivers and barriers of responses to climate action among general practices. Our research contributes to knowledge on managing the challenges of decarbonisation in the health care sector.

- **SDGs addressed:**
 - *SDG 13: Climate action*
 - *SDG 3: Good health and wellbeing*
- **Intended tracks:**
 - *Public Management & Governance*
 - *Sustainable & Responsible Business*
- **Developmental paper, empirical research**

Background

Knowledge on how the healthcare sector is addressing and managing climate change is sparse (e.g., Bartram et al., 2018). So far, examining the managerial implications for public sector organisations has primarily occurred in healthcare sector-specific journals and communities (e.g., Braithwaite et al., 2024; MacNeill et al., 2017). Considering the healthcare sector is a major contributor of greenhouse gas emissions (Or, 2024) and has much to learn from (or may even teach) other industries, a stronger integration into the management literature is desirable.

Globally, the sector is estimated to account for 4.4% of net carbon emissions (Pencheon and Wight, 2020). Similarly, in England, the NHS accounts for 4% of the country's total carbon footprint, of which about 23% can be attributed to primary care (NHS, 2022; Tennison et al., 2021). As a major source of greenhouse gas emissions, the sector is exacerbating the healthcare crisis arising from climate change while at the same time being directly affected by it (Romanello, 2022). For instance, extreme weather and climate events such as droughts, floods and heat waves have a negative impact on physical and mental wellbeing and are linked to human morbidity and mortality (Ebi et al., 2021). Moreover, climate change is not only exerting pressure on communities and populations around the world but also on an already strained system (Ebi, 2017). The World Economic Forum, for instance, estimates that by 2050 the impact of climate change on healthcare systems will amount to \$1.1 trillion in extra costs (Eitelwein et al., 2024). As such, any efforts to mitigate and adapt to climate change must involve the healthcare sector. In response, the UK's National Health Service (NHS) announced plans to become the world's first net zero national health service, aiming to achieve net zero for directly controlled emissions by 2040 (NHS, 2022).

General practice plays a critical role in the NHS' effort to mitigate the environmental impact (MacNeill et al., 2021). Estimates suggest a general practice visit is associated with, on average, the emission of 66 kg CO₂e (Tennison et al., 2021). The main sources of GHG emissions broadly fall into clinical (e.g., medical instruments, equipment and consumables) and non-clinical footprints (e.g., building energy, water, waste, services and travel) (Walsh et al., 2024). As the first point of contact in the healthcare system, primary care and particularly general practice are also at the forefront of responding to ongoing and future climate change related threats to public and community health (NHS, 2022; Karaba et al., 2024). Together, this underscores the crucial role of primary care in mitigating the health impacts of climate change while adapting to its emerging effects (Yang et al., 2020). In this research we, therefore, ask which factors shape decarbonisation in general practice?

Prior research has already pointed to the role of general practitioners as health advocates, role models and sources of information pertaining to climate change by raising awareness of its impact on human health (André et al., 2022). Others emphasise their role in the implementation of sustainable actions by adapting their practices and changing behaviour despite multiple constraints (Müller et al., 2024; Legrand et al., 2023). Studies have drawn attention to institutional and organizational constraints faced by general practitioners (GPs), such as, for example, a lack of universally adopted guidelines for addressing climate change among patients (Boland and Temte, 2019; Fehrer et al., 2023), billing concerns as well as physicians' organizations and networks being unable to provide practical and specific practice-level guidance about how to implement mitigating actions (Legrand et al., 2023). Research also indicates that climate change initiatives require personal effort, behavioural change, organizational leadership as well as institutional and policy support in order to succeed. These factors are especially relevant for practices faced with increased workloads and staff shortages (Nunes and Dale, 2024; Foley, 2023; Griesel, 2023; Legrand et al., 2023).

Together, these findings also mirror insights from management research which has explored the individual, managerial, organisational and institutional factors shaping business responses to climate change. The number of studies has grown strongly and demonstrated the value of different psychological, sociological, and economic theories and frameworks (Unter et al., 2024). Broadly, there is a consensus that a multitude of factors across different levels help explain the adoption of or resistance to change, especially mitigation of carbon footprints (Berger-Schmitz et al., 2023; Goworek

et al., 2018; Paul et al., 2024). Since general practices are embedded within a wider network of interconnected and overlapping institutions and entities, particularly the national health systems (Braithwaite et al., 2024), it stands to reason many of these factors and issues are similar.

Insights about how small firms engage with climate change are particularly helpful as general practice – in contrast to hospitals and social care provider – are also self-organised and profit oriented, i.e. they are broadly comparable to such enterprises (Clarke and Slavin, 2011). For instance, findings suggest many small businesses suffer from an “attitude-action gap”, highlighting particularly the importance of providing “actionable information” as key for their support (Mole and Ri, 2023). Moreover, operating as quasi-franchise chains, their organisational and institutional arrangements add to the complexities experienced by such entities when responding to environmental concerns (Kim and Lee, 2020; Le Bot et al., 2022; Perrigot et al., 2021), though research in this area is still limited.

Building on such insights from extant management and healthcare literature and drawing on the combined empirical findings from a large, multi-year and multi-study research project set in the UK, *the aim of this paper is to develop an integrative framework of the factors shaping decarbonisation in general practice*. More specifically, we seek to model the systemic nature collectively characterising the drivers and barriers of responses to climate action among general practices.

The unparalleled nature of climate change in relation to scope, timeline and complexity calls for a consideration of the full range of distributional consequences of climate change and decarbonisation processes across all levels of the health sector, i.e. professional, organizational and institutional (Frumkin, 2008; Abram, 2022). Importantly, such an analysis must also acknowledge the role of patients, both in terms of being affected by existing health inequalities and being exposed to the effects of climate change (Al Marwani, 2023; Rocque et al., 2021). Their engagement in and attitudes towards decarbonisation efforts matter strongly given significant concerns about the wider funding and functioning of the overall health care system. As acknowledged, a systems-based approach is thus desirable to better understand how the sector can leverage its resources and position to reduce its carbon footprint and mitigate the threat of climate change to human health and environmental sustainability while improving health care outcomes (Husted et al., 2025; Pongsiri et al., 2017).

The need for systems thinking

Fundamentally, classed as “grand challenges” and “wicked problems”, there is widespread agreement about the inherent complexity and systemic nature of many sustainability issues, such as climate change, which result from the relationships and interconnections between different factors, many of which typically reside at different levels of analysis (Abson et al., 2017; Voulvoulis et al., 2022). While broader frameworks such as the UN Sustainable Development Goals, the planetary boundaries and Doughnut Economics acknowledge their existence, developing lasting and effective responses and interventions to such challenges remains elusive without greater efforts to integrate the interconnections into analysis and decision making (Waddock, 2024).

Originating from scholarship on open systems in physics and biology (von Bertalanffy, 1950), systems thinking has been variously described as a theory, a method, or a broader perspective (Grewatsch et al., 2023). Unlike more traditional reductionist approaches studying the predictably causal relationships between clearly defined variables within specific functional or disciplinary silos, systems thinking seeks to understand the complexity and dynamics of whole systems, be they of economic, social and ecological nature, as well as, more importantly, the interconnections between them (Holling, 2001; Williams et al., 2017). Systems have been defined as “a grouping of parts that operate together for a common purpose” (Forrester, 1968, p.1). Increasingly, scholars also seek to apply the principles, tools and approaches of systems thinking to the organisational context (Cabrera et al., 2018; Marshall and Brown, 2003) and especially their interactions with the wider socio-ecological systems within which they are embedded (Gualandris et al., 2024).

Furthermore, papers inspired by systems thinking tend to conceptualize their phenomena across multiple levels, including individual, organization and whole systems (Carmine and De Marchi, 2023; Hahn et al., 2014; Schad and Bansal, 2018). This comes in response to widespread recognition that many of the world’s most vexing grand challenges defy simplistic reductionist analysis, and which instead require alternative approaches of sensemaking and understanding (Meadows, 2008; Sterman, 2012).

Overcoming the tendency for individual actors, especially business and here, general practices, to address sustainability issues in isolation without adequately reflecting on the complex tensions and trade-offs is therefore essential for achieving progress (Hermwille et al., 2023). In this context, therefore, systems (Grewatsch et al., 2023; Tsoukas, & Dooley, 2011) and nexus-thinking approaches acknowledge the varying spatial and temporal scales as well as multitude of actors shaping many sustainability challenges and the complexities involved in moving towards a safe and just planet (Gupta et al., 2024; Bansal et al., 2021; Dahlmann & Bullock, 2020).

Systems thinking is particularly suitable and necessary for enhancing researchers’ capacity to mobilise knowledge for solving complex problems in the health and care setting (Haynes et al., 2020). For example, a systems-based approach has also been recognised and advocated for in the context of addressing mental health challenges emerging from climate change (Berry et al., 2018). Specifically, systems thinking allows researchers to connect both details and the “bigger picture” in order to overcome silo-based, single level policy prescriptions without fully appreciating the “nestedness” of different systems.

Methods and anticipated contribution

Empirically, our research draws on the cumulative findings of a multi-year study comprised of a 12-month longitudinal study, surveys, focus groups and interviews. Table 1 provides an overview of the key studies, their respective methods and samples. The results and findings of these individual studies have already been reported elsewhere (Karaba et al., 2024; Nunes et al., 2024; 2025) or are under development. Here, instead, our aim is to provide a more conceptual synthesis of these insights by developing an integrative model describing and explaining the drivers and barriers to decarbonisation among general practices in the UK.

To this end, we revise and elaborate our initial programme theory (IPT) (figure 1) based on these emerging findings. Our research contributes to literatures on managing the challenges of decarbonisation in the health care sector generally, and the context of general practices specifically. In doing so, we begin to lay the foundations for future research on organisational and managerial responses to sustainability issues in the public sector. Our research illustrates similarities and differences compared to private sector responses (e.g., especially small and franchise-based enterprises) that have been studied elsewhere (e.g., Mole and Ri, 2023; Perrigot et al., 2021).

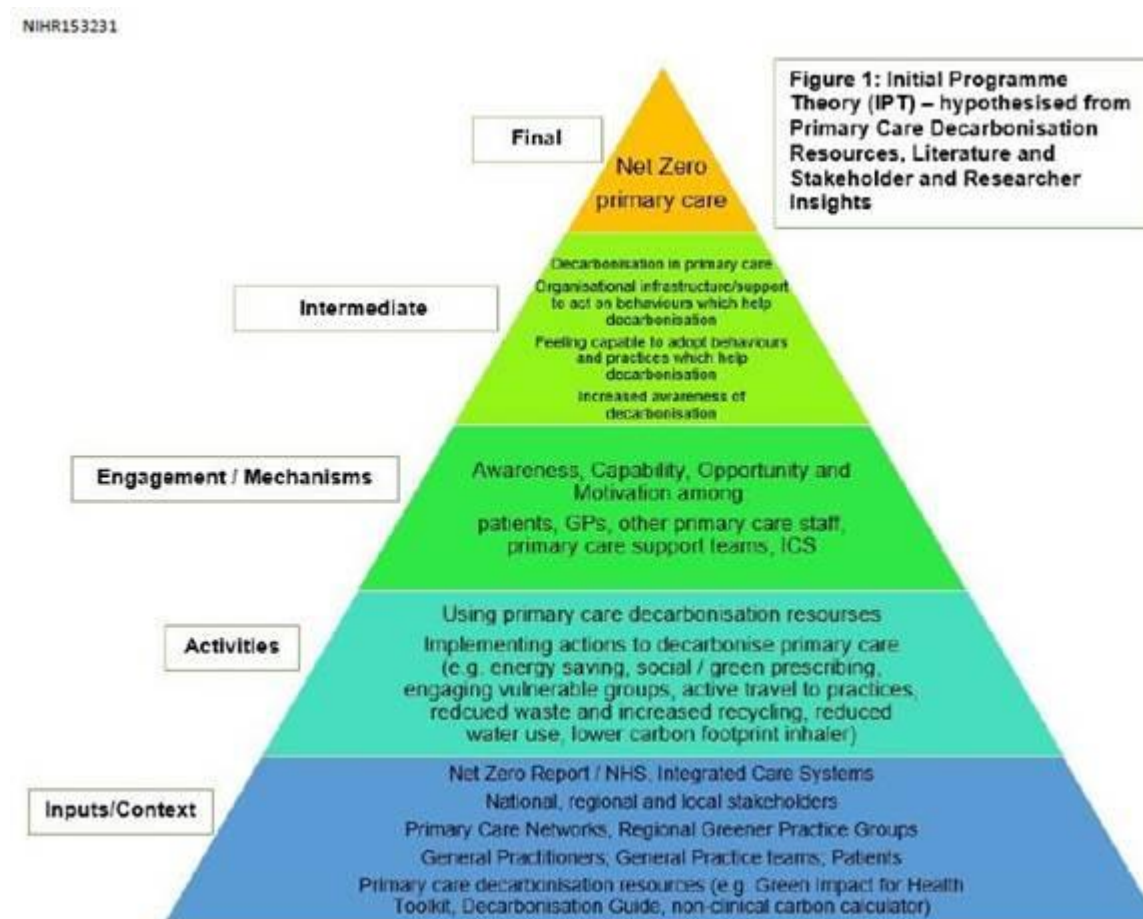
Further, by adopting a systems thinking approach our research integrates multi-level perspectives and a recognition of the interconnections between different drivers and particularly barriers affecting the adoption of decarbonisation efforts in general practice. As such, we seek to demonstrate the value of systems thinking in the context of complex socio-ecological challenges and its benefits for guiding analysis and action such as knowledge mobilisation in the health care sector (Berry et al., 2018; Haynes et al., 2020; Pongsiri et al., 2017).

Table 1: Empirical studies covered by the research project

Study	Sample and method
<i>General Practice survey</i>	Cross-sectional, mixed methods, online survey, sample drawn from three Integrated Care Board regions in England, 328 responses from 163/473 (34%) eligible practices, 23 items,

<i>Longitudinal study</i>	Longitudinal, qualitative study, 12 English general practices, baseline workshop, follow ups after 2 weeks, 3, 6 and 9 months via facilitated, recorded focus group discussions
<i>Patient survey</i>	Cross-sectional, quantitative study, 400 responses from patients affiliated with 12 general practices covered by longitudinal study, 15 items
<i>Patient interviews</i>	Cross-sectional, qualitative study, 30 in-depth interviews with patients partly self-selected from survey, 11 questions
<i>Budget impact model</i>	Cross-sectional, quantitative study, modelling based on literature review and feedback from longitudinal study; generic and practice-specific model balancing costs and impacts of carbon reduction interventions
<i>Stakeholder interviews</i>	Cross-sectional, qualitative study, 35 interviews with national, regional and local stakeholders

Figure 1: Initial Programme Theory (IPT) developed prior to empirical research studies conducted

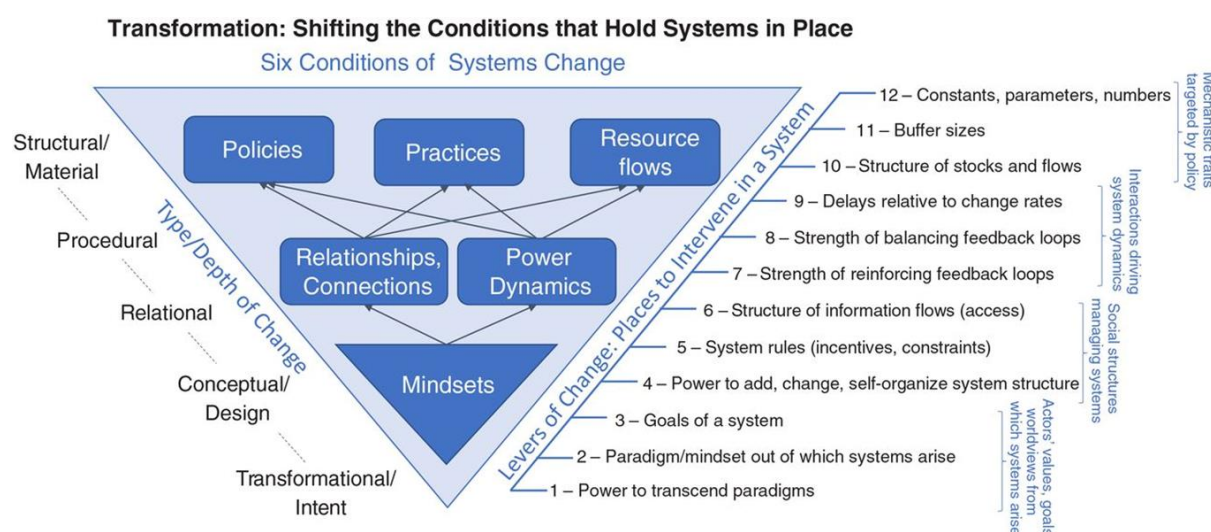


Findings

To help structure our emerging findings grounded in a systems perspective, we draw on leading systems thinkers and their analysis of the fundamental challenges and barriers that prevent them from being transformed. Specifically, researchers have identified six of conditions which vary to the extent they affect the type or depth of systemic change (Meadows, 2008). Specifically, these conditions fall

along structural/material, procedural, relational, conceptual/design and finally, transformational/intent types of changes (figure 2). As Shi and Moser summarise: “At the surface level, policies, practices, and resource flows are determined at a deeper level by the processes, relationships, and power dynamics among those making decisions, which in turn is a reflection of the mindsets, values, and beliefs of those involved” (2021: 2).

Figure 2: Six conditions that hold systems in place (Source: Shi, L. and Moser, S., 2021. Transformative climate adaptation in the United States: Trends and prospects. *Science*, 372(6549), p.eabc8054. <https://www.science.org/doi/full/10.1126/science.abc8054>)



Below, we present headline findings identified across different work packages and their associated publications as well as comments received from patient-public involvement (PPI) group members during knowledge mobilisation workshops by clustering them along the key systemic barriers and conditions. This work is currently ongoing with several work packages still being completed. Further findings will be added as and when available.

Table 2: Emerging findings as organised by systemic barriers and condition

Systemic barriers and conditions	Key Findings	Source of evidence
<i>Policies</i>	• Anti-trust/collusion policies stopping pharmaceutical companies from collaborating on GHG emissions reductions • Shifting national (health) policy aims and priorities	PPI
<i>Practices</i>	• Time & administrative constraints • Practice setting (access to public transport) • Practice ownership (“split incentives”) • Workshops with multidisciplinary general practice teams effectively support decarbonisation planning • Having a decarbonisation lead is linked to greater use of decarbonisation resources and future action planning • 28.8% of practices considering undertaking decarbonisation actions mainly focused on energy use, paper reduction, and inhaler prescribing	WP2; PPI

	• Educational sessions for patients at the practice to inform them about climate change viewed as conducive to fostering engagement • Use of straightforward and understandable language needed to encourage patient engagement	
<i>Resource Flows</i>	• GP funding and contracts • Recycling costs • Lack of visibility of cost implications • Changing nature of the electricity grid • Lack of divestment/sustainable banking among GMC and practices/GPs • Key barriers to decarbonisation noted by staff include workload, time constraints, and limited funding. • Nearly half of practices either unaware of or had not used available decarbonisation resources. • Only 13.4% of staff feel they have sufficient training and resources for decarbonisation, with GP partners less likely to agree. • Patients see lack of information as a barrier to taking action to reduce practice-related emissions. • Time constraints and busy patients' schedules (reason for low engagement) • Accessibility issues—such as language, digital exclusion, and disability—highlight the need for more inclusive research methods, with a preference for face-to-face engagement over digital approaches.	WP2; WP3; PPI
<i>Relationships & Connections</i>	• Lack of organisational culture/environmental leadership • Patient concerns about impacts on quality & accessibility of care • Lack of GP and patient awareness and information on relationship between climate change and health • Lack of utilising and amplifying patient voice (beyond PPI) • Lack of collective purchasing networks between GPs • Lack of coordination between GPs and other (potential) providers of health & care outcomes and benefits • Survey fatigue as a barrier to patient engagement with study. • Disconnect between researchers and patients (reason for low patient engagement) • Accessibility issues—such as language, digital exclusion, and disability—highlight the need for more inclusive research methods, with a preference for face-to-face engagement over digital approaches. • Poor communication between general practices and patients as barrier to patient engagement. • Need to communicate research outcomes to participants (to encourage engagement).	WP2; WP3; PPI
<i>Power Dynamics</i>	• Questions over governance, structure and role of the NHS • Prioritisation of non-clinical over clinical carbon reduction cited as easier. • Only 18% of general practice staff felt there was adequate leadership from higher levels to take actions relating to	WP2

	decarbonisation, with GP Partners reporting the lowest support (7.1%). Practices with a designated decarbonisation lead significantly more likely to see carbon reduction as part of their role and to view sustainability as a shared value.	
<i>Mindsets</i>	- Questions over framing of decarbonisation and Net Zero - Underutilised potential of focusing on prevention via healthy living & eating with environmental co-benefits - Differences in individual staff knowledge and perceptions of decarbonisation activities within the practice. - Most general practice staff (69.8%) view carbon reduction as part of their role, though clinical staff are more likely than non-clinical staff to hold this view. - Patients concerned that general practices' environmental efforts may impact healthcare quality and access. - Stakeholders feel the term 'decarbonisation' is too narrow and uninspiring. - Majority of patients believe individuals should take more action to cut their carbon emissions. - Stakeholders highlight the importance of framing sustainability efforts around patient care and co-benefits to health and the environment - Survey fatigue regarded as a barrier to patient engagement with study - Importance of making climate change and sustainability relevant to patients' immediate concerns to encourage engagement.	WP2; WP3; WP5

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