Operationalising Sustainability in Healthcare:

Staging and Facilitating Collaborative Action through a Game-Based Tool

MSc Thesis - May 2025

Title page

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Abstract

Healthcare systems are increasingly expected to take responsibility for their environmental footprint, yet the translation of sustainability ambitions into clinical practice remains limited by structural, cultural, and professional barriers. This thesis explores how a participatory, game-based tool - The Path to the Climate Jewels - can support the operationalisation of sustainability strategies by engaging clinicians in initiating and coordinating concrete actions within hospital settings.

Building on design research and the frameworks of Staging Negotiation Spaces (SNS) and Arenas of Development (AoD), the study investigates how the game is used, facilitated, and embedded in the complex organisational landscape of the Danish healthcare system. Through a qualitative case study including workshop observations, facilitator collaboration, and participant feedback, the research analyses how the game helps align diverging clinical and environmental concerns across institutional boundaries.

Findings show that the game functions as more than a tool - it becomes a strategic intervention that enables healthcare staff to surface and reframe sustainability challenges, co-design actionable initiatives, and initiate change within their own practice. Crucially, its success depends not only on the game format but on how it is contextually staged and supported.

This thesis contributes both practical recommendations for implementation and theoretical insights into the role of participatory, game-based tools in staging and facilitating collaborative change. It demonstrates how sustainability can become actionable when abstract goals are translated into locally situated negotiations - bridging the persistent gap between ambition and practice in healthcare sustainability transitions.

Author Reflection and Positioning

As three students graduating from the MSc programme in Sustainable Design Engineering at Aalborg University Copenhagen, we bring with us a shared foundation shaped by years of working with real-world challenges, always in close collaboration with external stakeholders. Throughout our education, both at bachelor and master level, we have developed a problem-oriented and holistic approach to sustainability, grounded in user involvement, interdisciplinary collaboration, and critical reflection.

Most of our previous design projects have concluded at the stage of conceptualisation, where solutions were proposed but not implemented. These processes have generated valuable insights but often left us questioning how to ensure that meaningful ideas lead to meaningful action. With this thesis, we have had the opportunity to take a step further, starting where we normally finish, to explore how design solutions for sustainable change can take root and be supported in use.

We are not interested in action at any cost. For us, sustainability is a complex, systemic and context-specific challenge, spanning environmental, social, and economic dimensions. This calls for meaningful, grounded action, rooted in local realities, and shaped through collaboration across perspectives and professional boundaries. Creating the conditions for such action is at the heart of what we see as our role.

This project has allowed us to work within an implementation process and to explore how collaborative design can help transform strategy into meaningful practice. For us, this is what it means to act as sustainable design engineers: to support others in creating sustainable change that is not only intended, but enacted.

Terminology Specific to Region H

This section provides an overview of key terms and organisational structures specific to the Capital Region of Denmark (Region H) as used throughout this thesis. While these terms are introduced in context, this overview serves as a reference to support the reader's understanding.

The Capital Region of Denmark (Region H)
The administrative and healthcare authority responsible for hospital services in Eastern Denmark, including Copenhagen.

Green2030 Programme
Region H's strategic climate programme aimed at reducing regional CO_2 emissions by 50% by 2030. It encompasses 24 climate efforts coordinated across hospitals and clinical settings. These include:

- **Hospital-Led Climate Efforts**
  Strategic, system-level sustainability projects initiated at the hospital level. These involve partnerships between designated lead and partner hospitals.

- **Employee-Led Climate Efforts**
  Smaller-scale initiatives initiated by individual staff members, like Green Ambassadors, often focusing on tangible or product-oriented environmental improvements within hospital departments.

The Section for Green and Innovative Procurement (the Section)
A specialised unit within Region H that coordinates the Green2030 agenda specifically in relation to hospital procurement and material use.

Project Managers
Employees in the Section who support both hospital-led and employee-led climate efforts. Each project manager is assigned to one or more hospital-led climate efforts, where they provide strategic input, guidance, and facilitation. They also support employee-led climate efforts by training Green Ambassadors, and they develop tools to support the climate efforts:

- **The Green Staircase**
  A visual decision-making tool developed by the Section to prioritise sustainability actions based on impact: "Use less," "Use longer," and "Use sustainable alternatives."

Green Director
A senior representative from each hospital's executive management who holds overall responsibility for hospital-led climate efforts.

Green Coordinators
Administrative staff (sometimes with clinical backgrounds) responsible for coordinating and supporting climate efforts at individual hospital sites.

Green Ambassadors
Frontline staff (e.g., clinicians, service staff) trained through a 3-day course to initiate and promote sustainable practices and initiate employee-led climate efforts within their departments.

Steering Group
Self-organised local management teams leading specific hospital-led climate efforts. Typically includes clinical decision-makers, a Green Coordinator, and the Green Director.

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1 Introduction

The thesis presents a design research project carried out by three M.Sc. students in Sustainable Design Engineering at Aalborg University, Copenhagen. The aim of the research is to explore how the use of a game-based tool can support the ongoing transition toward environmentally sustainable hospitals.

The project is developed in collaboration with the Section for Green and Innovative Procurement (referred to as the *Section)* within the Capital Region of Denmark (referred to as *Region H*). The Section plays a central role in supporting Region H's efforts to reduce the environmental impact of its healthcare services, in line with the Regional Council's political commitment to halve Region H's climate footprint by 2030 and ultimately achieve climate neutrality by 2050 (Gaardhøj, 2023).

The collaboration with Region H takes place within a broader international movement urging healthcare systems to address their environmental footprint.

1.1 Positioning healthcare within the global sustainability agenda

In recent years, healthcare systems have increasingly been called upon to contribute to the worldwide transition towards environmental sustainability. A significant turning point came in 2015 when the Rockefeller Foundation–Lancet Commission introduced the concept of planetary health, highlighting the interdependence of human health and environmental systems, urging healthcare systems to reduce their environmental impact while increasing their resilience to climate-related threats and promoting public health (Whitmee et al., 2015). Hereafter, a growing consensus has emerged around the importance of integrating environmental sustainability into the healthcare sector. One notable milestone in this development was the publication of a strategic document in 2017 by the World Health Organisation (WHO), which formally defined what it means for health systems to be environmentally sustainable (World Health Organization, 2017):

"An environmentally sustainable health system would improve, maintain or restore health, while minimizing negative impacts on the environment and leveraging opportunities to restore and improve it, to the benefit of the health and well-being of current and future generations" (World Health Organization, 2017, p. V).

Furthermore, the document presents ten strategies for action, ranging from waste management and sustainable procurement to workforce engagement and innovative models of care, marking a shift towards operationalising sustainability efforts (World Health Organization, 2017).

In 2019, the healthcare sector's global climate footprint was, for the first time, estimated in detail. The analysis placed the sector's 2014 emissions at 2.0 gigatonnes of CO_2e, equivalent to 4.4 % of global net emissions. In several countries, the healthcare sector accounts for an even greater share of national emissions. In Denmark, healthcare is estimated to account for 6.3 % of national emissions. From a per capita perspective, Denmark stands out as a major emitter, producing 0.78 tonnes of CO_2e per capita related to health activities, nearly three times the global average of 0.28 tonnes CO_2e per capita. This underscores the responsibility of high-emitting countries to take the lead in healthcare climate action (Health Care Without Harm, 2019).

Another milestone was the 2020 commitment by the UK's National Health Service, making it the world's first healthcare system to pledge to achieve net-zero carbon emissions by 2040, setting a precedent for health systems globally (Global climate & health alliance, 2020).

Calls for action have also gained momentum. In 2021, more than 200 health journals jointly called on governments to take immediate and ambitious climate action, framing the climate crisis as an urgent and

escalating threat to public health (The Guardian, 2021). These calls have further been echoed by the WHO, which in 2023 coordinated a global appeal, gathering signatures from more than 42 million individuals and organisations in the health community, urging action to address both the climate crisis and the public health emergency it is accelerating (World Health Organization, 2023).

Together, these milestones reflect a fundamental shift in the healthcare sector; environmental sustainability is no longer a peripheral concern but increasingly framed as a core responsibility of modern health systems. However, this shift is not yet matched by transformative action. Across the literature, there is consistent evidence that despite formal commitments, sustainability strategies often remain decoupled from everyday healthcare practices (Cavicchi et al., 2022; Sijm-Eeken, Ossebaard, et al., 2024; Sumrit, 2025). Rather than becoming embedded in the core logic of healthcare delivery, sustainability efforts often remain fragmented across departments or confined to motivated individuals lacking broader institutional support (Badanta et al., 2025; Spicer et al., 2020).

These patterns reveal a persistent dilemma, although sustainability is increasingly prioritised at the strategic level, it remains unevenly embedded in day-to-day healthcare practice. The gap between ambition and implementation continues to limit the impact of sustainability efforts across the sector. As the WHO has emphasised, healthcare differs from other sectors in that no trade-offs can be accepted between environmental sustainability and the core functions of healthcare delivery. All climate actions must support - not compromise - clinical care quality (World Health Organization, 2017).

Considering this persistent gap between ambition and implementation, this thesis explores how a participatory, game-based tool can support the operationalisation of sustainability strategies in a hospital setting. A participatory design approach offers a way to bridge the gap by engaging the healthcare staff affected in shaping future practices, and participatory tools and processes can help translate complex challenges into collaborative, situated and actionable solutions through inclusive and democratic means (Simonsen & Robertson, 2013).

1.2 Case Study: Engaging Clinicians through Design

The disconnect between political ambition and practical implementation is also evident in the Danish context. Denmark's healthcare system is organised into five regions, whose primary task is to manage and administer hospital services and the broader public healthcare system (Danske Regioner, n.d.). As part of their responsibilities, the regions have jointly committed to reducing the healthcare-related CO2 emissions by 50 % before 2035, aiming to achieve climate neutrality of the Danish healthcare system by 2050 (Danske Regioner, 2023). Figure 1 shows the distribution of greenhouse gas emissions from hospitals and other regional institutions in 2022, highlighting that a significant share of 47 % originates from the procurement of disposable equipment and medical supplies (Danske Regioner, 2023).

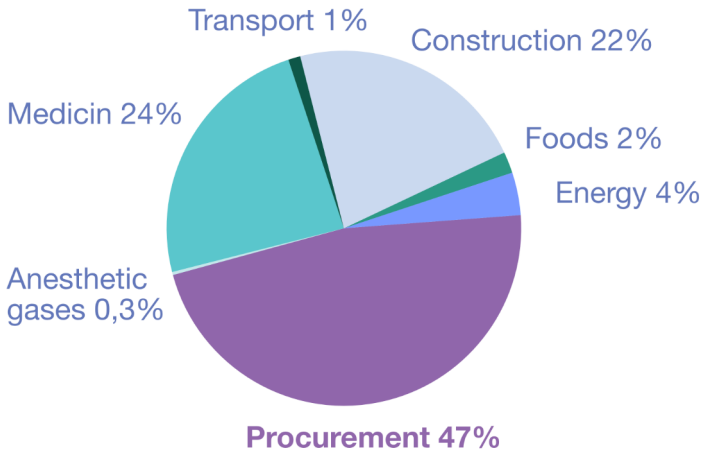


Figure 1: Hospitals and other regional institutions' greenhouse gas emissions in 2022, adapted from Danske Regioner, 2023.

This highlights the relevance of targeting consumption-related climate efforts within hospitals and the need to involve healthcare staff in identifying feasible ways to reduce emissions without compromising patient care or safety - particularly given the clinical complexity of these decisions.

While all five regions share responsibility for meeting the national climate goals, Region H has set an even more ambitious political target of halving its healthcare-related emissions *by 2030* (Gaardhøj, 2023).

This challenge is addressed through Green2030 (*Grøn2030)*, a regional climate programme coordinating 24 strategic climate efforts (Region H, n.d.). These include cross-cutting efforts, centre-led efforts, as well as hospital-led and employee-led efforts, each with varying scope and implementation challenges. This thesis focuses on the latter two, which are expected to be initiated and coordinated by healthcare staff and local project groups within clinical practice. Figure 2 provides an overview of these two types of efforts and how project managers are employed in the Section to support them directly.

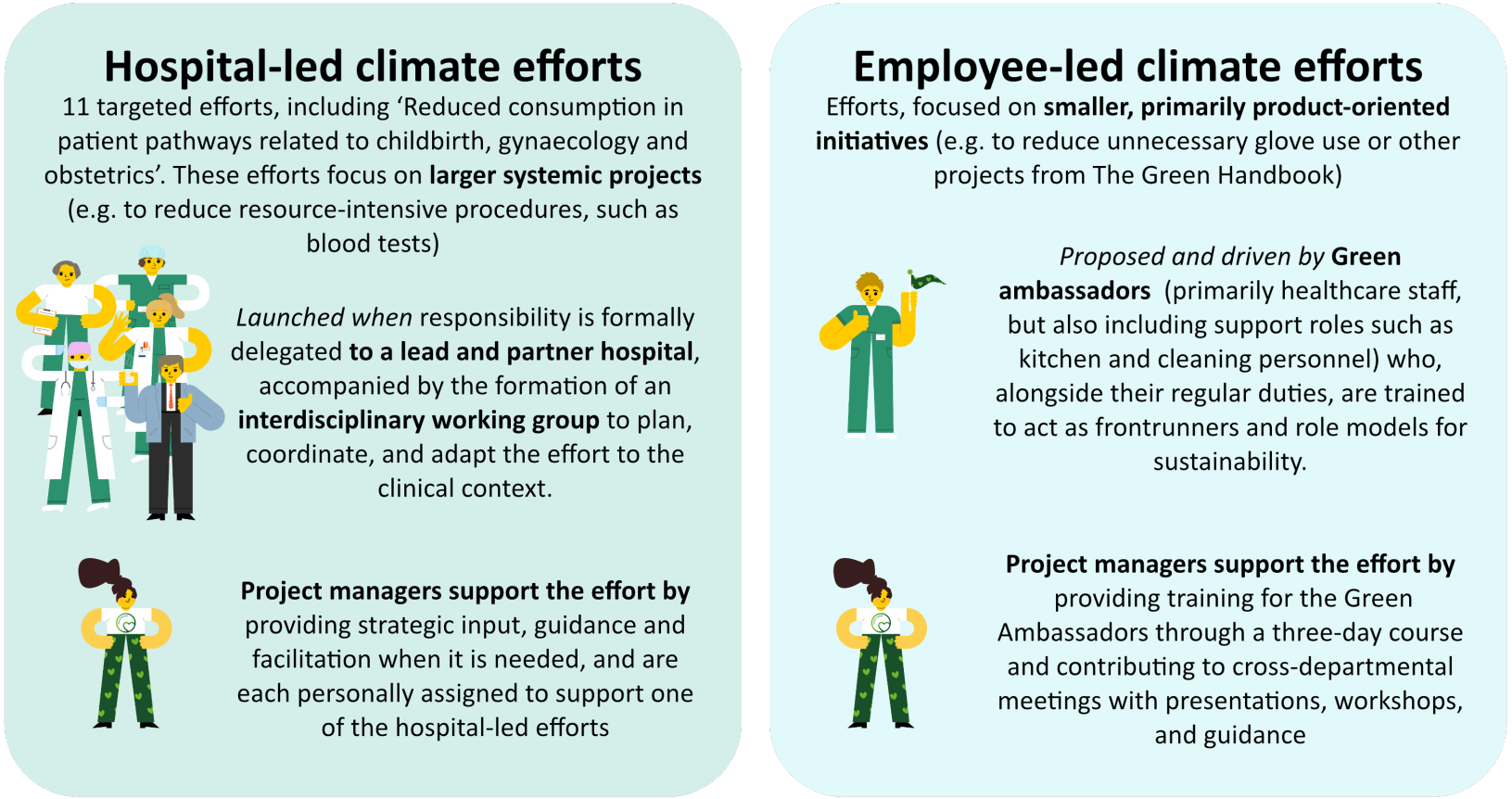


Figure 2: Overview of hospital-led and employee-led efforts and the project managers' support

As noted by the project managers, many initiatives within the climate efforts remain difficult to initiate or sustain, despite a structured governance setup, including green directors, coordinators and support from the Section. Healthcare staff, including clinicians and healthcare management, often face unclear starting points, limited time and resources, lack of knowledge, and weak interdisciplinary coordination. Without shared structures or strategic overview, efforts risk becoming fragmented, poorly prioritised, or never initiated (App. A).

As illustrated in Figure 3, these barriers constitute a clear implementation gap between Region H's sustainability goals and their translation into clinical practice, highlighting a clear need for tools that can support collaboration, clarify responsibilities and help translate intentions into coordinated, practical action (App. A).

Figure 3: The implementation gap between strategic climate efforts and their realisation in clinical practice

To address these barriers, the game-based tool *The Path to the Climate Jewels* was developed during an internship in autumn 2024 (Vogel & Gilbu, 2025) through a co-design process with healthcare staff and the Section's project managers. The game builds on known design processes and principles, such as double diamond and participatory design, to engage healthcare staff in a structured collaborative gameplay process. The game thereby aims to bridge the implementation gap between the strategic climate efforts and the realisation in clinical practice, as depicted in Figure 4.

However, the game does not operate in isolation. Its success depends on how it is introduced, facilitated, and embedded within existing organisational structures, which is particularly significant now that the game is being implemented across the hospitals in Region H.

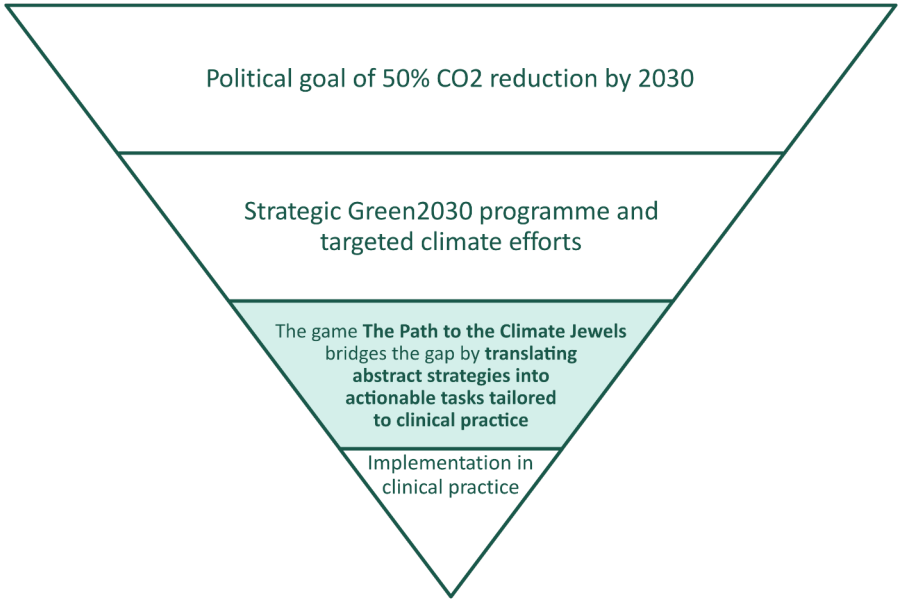


Figure 4: The game The Path to the Climate Jewels as a tool to bridge the implementation gap between strategy and clinical practice

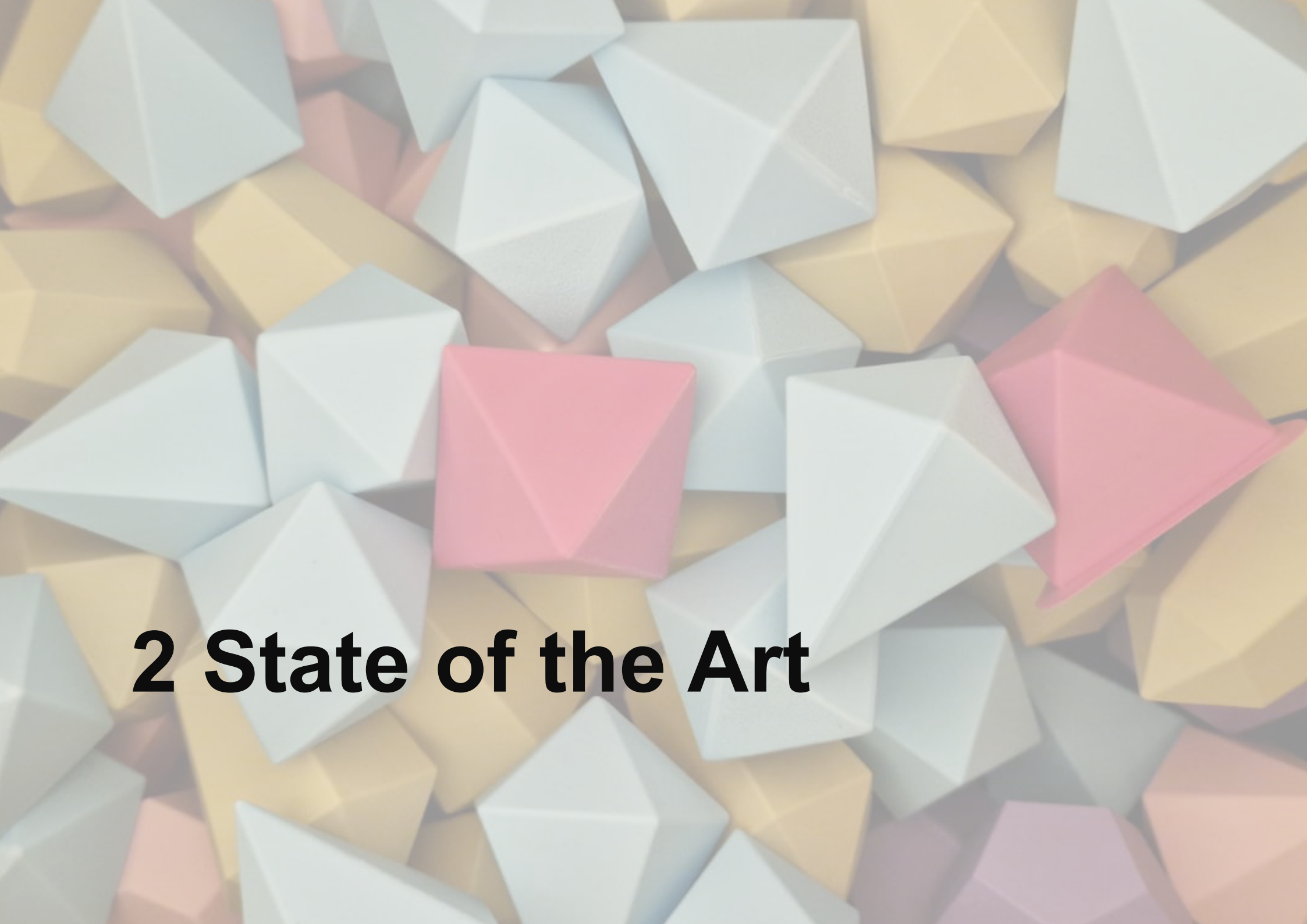
This thesis, therefore, focuses not only on how the game is used in real-world hospital settings, but also on how facilitation and contextual framing shape its effectiveness. By exploring what works, what needs refinement and what conditions enable successful engagement, the study contributes both practical recommendations and design research insights into the use of participatory tools for sustainable healthcare transformation.

1.3 Research Question

The thesis explores how participatory game-based approaches can support the operationalisation of sustainability strategies in clinical hospital settings. Building on the implementation of The Path to the Climate Jewels, the study investigates how such tools can help translate strategic ambitions into practice within the context of the environmental transition in healthcare.

The research is guided by the following question:

How can the use of a game-based tool support the operationalisation of sustainability strategies by engaging clinicians in initiating and coordinating concrete actions within hospital settings?



2 State of the Art

To ground this thesis in existing knowledge, this section reviews current literature on sustainable transitions in healthcare. It examines the key barriers that prevent environmental ambitions from becoming embedded in everyday clinical practice as well as the enabling conditions that support implementation. This review helps frame the relevance and potential of participatory, game-based approaches by clarifying the complex organisational landscape into which such tools are introduced.

2.1 Barriers to Operationalising Sustainability and Making it Actionable

Despite growing awareness of healthcare's environmental impact, many sustainability ambitions struggle to become embedded in clinical practice. Current literature consistently points to three interrelated categories of barriers: *Cultural and motivational constraints, knowledge and competence gaps,* and *institutional and structural barriers*.

The healthcare literature has been selected to cover multiple specialities and different healthcare professionals, as well as diverse national contexts. While acknowledging institutional and cultural differences between countries, this review highlights recurring patterns and shared insights across specialities, disciplines, and the perceptions of barriers to implementing sustainability initiatives.

Cultural and Motivational Constraints

Organisational culture, individual attitudes and motivation play a key role in inhibiting sustainable action. Studies show that many clinicians support sustainability in principle, but experience apathy among colleagues or view environmental action as beyond their clinical responsibility (Poo et al., 2025; Sepetis et al., 2024). Sustainability is often deprioritised in the face of competing clinical demands, with front-line staff favouring expedient practices over environmentally responsible ones due to time pressure and the imperative focus on patient care (Aboueid et al., 2023; Zoromba & EL-Gazar, 2025). Concerns about patient safety and infection control further reinforce resistance to adopting sustainable practices, particularly those involving reuse or recycling (Bajwa et al., 2025; Pavli et al., 2023).

At a deeper level, organisational culture shaped by entrenched hierarchies and professional silos, limits collaboration and discourages open engagement, resulting in trained staff lacking the perceived authority to challenge unsustainable routines (Aronsson et al., 2020; Badawy et al., 2024; Jia et al., 2025). These dynamics are closely related to leadership commitment. Without leadership support and explicit signalling that environmental responsibility is a shared organisational value, sustainability risks remain an individual concern rather than a cultural norm (Sepetis et al., 2024; Zoromba & EL-Gazar, 2025). In addition, the lack of incentives or recognition mechanisms weakens staff motivation, as sustainability-related efforts are rarely acknowledged or rewarded; without ongoing encouragement, initial enthusiasm fades over time, limiting staff engagement (Aboueid et al., 2023; Pavli et al., 2023; Zoromba & EL-Gazar, 2025).

Knowledge and Competence Gaps

Knowledge and competence deficits represent another significant barrier to sustainable action in healthcare. Many health professionals often express a willingness to engage in sustainable initiatives, but they lack the necessary training, knowledge, and skills to translate these strategies into practice. Across literature, studies consistently report low awareness of healthcare's environmental impact and uncertainty about which actions are most effective, with staff failing to identify the most impactful sources of emissions, instead focusing

on more visible issues such as waste and energy (Aboueid et al., 2023; Guihenneuc et al., 2024; Pavli et al., 2023; Poo et al., 2025; Westwood et al., 2023). Training deficiencies are widely cited as key barriers, with a majority of clinicians reporting lack of knowledge and training on environmental sustainability (Abuzaid & Almuqbil, 2025; Farzad et al., 2024; Poo et al., 2025; Tordjman et al., 2022; Zoromba & EL-Gazar, 2025). Knowledge gaps breed uncertainty and low confidence, making staff hesitant to challenge unsustainable routines and to implement sustainable initiatives (Aronsson et al., 2020; Bajwa et al., 2025; Pavli et al., 2023; Zoromba & EL-Gazar, 2025). While healthcare professionals are highly skilled in clinical care, the specialisation often limits the cross-functional knowledge needed to navigate the organisational and environmental complexities of sustainability implementation (Aboueid et al., 2023; Jia et al., 2025).

Institutional and Structural Barriers

Structural and institutional limitations consistently hinder efforts to integrate sustainability into healthcare. A recurring barrier is weak governance and a lack of strategic prioritisation for sustainability. Many healthcare organisations lack formal sustainability plans or policies, leaving sustainable initiatives to voluntary individual commitment and the persistence of small, informal groups, often without institutional support (Bajwa et al., 2025; Cavicchi et al., 2022; Zoromba & EL-Gazar, 2025).

Studies have shown that staff often perceive environmental sustainability as a low priority at their workplace, with weak leadership and limited management support contributing to low motivation (Abuzaid & Almuqbil, 2025; Sepetis et al., 2024). At the same time, many clinicians call for clearer guidance and official policies, yet few institutions have designated leadership responsibilities for sustainability, further reflecting lack of strategic direction (Boussuge-Roze et al., 2022; Poo et al., 2025). A lack of consistent performance monitoring systems further hinders progress, as sustainability is rarely embedded into formal decision-making or evaluated through measurable indicators, limiting accountability and long-term integration (DesRoche et al., 2025; Rouhana & Van Caillie, 2025). Healthcare sustainability efforts are further complicated by organisational complexity, including entrenched hierarchies, siloed departments, and the perceived complexity of implementation processes (Boussuge-Roze et al., 2022; Jia et al., 2025).

Resource and infrastructure constraints present additional obstacles to sustainability in healthcare. Hospitals often lack the financial resources, physical infrastructure, and time allocation for sustainability. High clinical workloads and lack of time limit staff capacity to initiate or maintain environmentally sustainable practices (Farzad et al., 2024; Guihenneuc et al., 2024; Sijm-Eeken, Greif, et al., 2024; Zoromba & EL-Gazar, 2025). Structural barriers such as tight budgets, cost, and insufficient financial support are widely reported (Abuzaid & Almuqbil, 2025; Badawy et al., 2024; Bajwa et al., 2025), alongside inadequate access to recycling equipment and other enabling infrastructure (Bajwa et al., 2025; Poo et al., 2025; Tordjman et al., 2022).

In sum, translating sustainability ambitions into coordinated healthcare practice remains a persistent challenge. Structural, cognitive, and cultural barriers interact to limit implementation, often leaving well-intentioned, staff-led initiatives fragmented and unsustained. Without clearer structures, shared responsibility, and integration into daily routines, sustainability risks remaining an aspiration rather than an embedded practice - highlighting the need to understand the conditions and drivers that can enable transformative action.

2.2 Enabling Sustainability: Conditions and Drivers for Action

While the previous section outlined the obstacles hindering sustainable practices, the current literature also highlights a range of enabling conditions that can aid healthcare organisations in overcoming these barriers. Achieving environmental sustainability in healthcare requires more than high-level declarations or individual motivation; it depends on aligning professional culture, collaboration and leadership (Cowie et al., 2020; Jia et al., 2025; Sepetis et al., 2024; Westwood et al., 2023; Zoromba & EL-Gazar, 2025). Drawing on current literature, this section outlines three interconnected conditions that can facilitate the operationalisation of environmental goals in healthcare organisations.

Professional Engagement and Cultural Change

Embedding sustainability in healthcare practice depends fundamentally on the engagement of the healthcare professionals delivering frontline care. Healthcare staff are increasingly recognised as pivotal change agents, as they can both implement sustainable practices and serve as credible role models for their peers; however, realising this potential requires cultural alignment and ongoing capacity-building (Badawy et al., 2024; Cowie et al., 2020; Zoromba & EL-Gazar, 2025). Studies show that targeted training and education increase staff confidence, competence and willingness to act sustainably, helping to reposition environmental responsibility as an integral part of professional identity rather than an external or competing demand (Bajwa et al., 2025; Guihenneuc et al., 2024; Zoromba & EL-Gazar, 2025).

Professional engagement also depends on how sustainability is framed within clinical practice. Initiatives are more likely to gain traction when they are presented in alignment with core healthcare values, such as patient care, efficiency, or cost-effectiveness, rather than as competing demands (Jia et al., 2025; Pavli et al., 2023). Demonstrating tangible co-benefits, including financial savings or improvement in clinical outcomes, can help secure engagement and shift perceptions of sustainability from burden to added value (Pavli et al., 2023; Westwood et al., 2023; Zoromba & EL-Gazar, 2025). Role models within the department, such as informal “green champions”, can further shift norms by demonstrating that change is possible and professionally meaningful (Badawy et al., 2024; Cowie et al., 2020; Kotcher et al., 2024; Zoromba & EL-Gazar, 2025). Sustained engagement and staff confidence also depend on visible and consistent support and endorsement from leadership and professional institutions, which help cultivate a professional culture where sustainability is integral to high-quality care (Cowie et al., 2020; Westwood et al., 2023).

Interdisciplinary Collaboration and Shared Accountability

Because healthcare delivery ultimately is a team endeavour, interdisciplinary collaboration emerges as another crucial driver for sustainable practice (Badawy et al., 2024; Gkouliaveras et al., 2025). No single professional group or department can implement sustainability in isolation; instead, it requires cross-functional collaboration to ensure that initiatives are coordinated across clinical and support functions, thereby preventing them from remaining siloed (Badawy et al., 2024; Jia et al., 2025). Shared accountability enhances this coordination by clearly distributing roles and fostering a collective sense of ownership for sustainability outcomes, which is essential to avoid fragmentation and ensure long-term implementation (Cowie et al., 2020; Sepetis et al., 2024). Clear and continuous communication across institutional levels, where leadership visibly shares sustainability goals and staff are empowered

to provide feedback, is equally important as it supports greater alignment and adaptability of sustainability efforts (Guihenneuc et al., 2024; Sepetis et al., 2024). Formal structures, such as multidisciplinary sustainability committees and cross-functional working groups, play a key role in coordinating sustainability efforts as they enable regular dialogue between functions, align priorities across departments and facilitate shared decision-making and co-creation of initiatives (Badawy et al., 2024; DesRoche et al., 2025; Guihenneuc et al., 2024; Jia et al., 2025; Smale et al., 2025).

Organisational Leadership and Governance

Strong leadership commitment and governance structures are repeatedly cited as critical enablers for sustainability in healthcare. Studies show that when hospital management visibly supports sustainability goals, e.g., by setting clear expectations, providing time and resources, holding teams accountable, it legitimises sustainability as a shared priority rather than an optional individual concern (Cowie et al., 2020; Sepetis et al., 2024). Such leadership can take the form of visible managerial commitment, establishment of steering committees or green teams, as well as informal advocacy from department-level "green champions", who act as role models (Aboueid et al., 2023; Badawy et al., 2024; Cowie et al., 2020; DesRoche et al., 2025; Guihenneuc et al., 2024; Smale et al., 2025; Zoromba & EL-Gazar, 2025).

To translate leadership commitment into operational practice, environmental goals must be embedded within organisational frameworks, such as the hospital's strategic plans, operational guidelines and quality metrics, to ensure consistent implementation across departments (Badawy et al., 2024; DesRoche et al., 2025; Rouhana & Van Caillie, 2025). Accountability, achieved by assigning clear roles, defining responsibilities, and monitoring progress, further helps ensure that sustainability is a shared commitment, thereby reducing the risk of fragmented efforts or a lack of follow-through (Aboueid et al., 2023; Cowie et al., 2020; Rouhana & Van Caillie, 2025). These governance mechanisms provide formal structures, such as sustainability committees and accountability systems, through which environmental efforts can be coordinated and sustained in practice (Cowie et al., 2020; Guihenneuc et al., 2024). However, these structures must be supported by adequate resources, such as protected time, training, and access to data, to translate ambition into consistent action (Cowie et al., 2020; Guihenneuc et al., 2024; Zoromba & EL-Gazar, 2025).

In summary, enabling sustainability in healthcare is not the work of a single intervention or profession, but rather the result of promoting professional engagement, fostering interdisciplinary collaboration and aligning governance structures. When leadership demonstrates visible commitment, clinicians feel supported and equipped, and teams work together across functions, sustainability can move from ambition to actionable practice.

2.3 Participatory Design in Healthcare

In response to the persistent barriers outlined above, and the enabling conditions of professional engagement and cross-disciplinary collaboration, participatory design (PD) can be a promising approach for bridging the gaps between strategic sustainability ambitions and everyday clinical practice. A PD approach have proven effective in addressing abstract challenges and proposing concrete solutions - as PD offers collaborative design methods that respond to the inherent complexity of healthcare systems by engaging diverse actors and creating space for them to voice their perspectives and concerns (Pedersen, 2020; Pedersen & Dorland, 2025).

The PD tradition has its roots in the field of information and communications technologies and stems from a democratic ambition to involve users and those affected by new technologies in shaping and influencing their design (Simonsen & Robertson, 2013). In PD, users are viewed as experts in their own needs, while designers act as facilitators of a co-design process. This approach enhances the quality of solutions by actively incorporating users' knowledge and experiences into the design (Simonsen & Robertson, 2013).

PD has already gained recognition in healthcare as a means to actively involve staff, patients, and other stakeholders in situated co-design processes, ensuring that interventions are grounded in real-world context and needs (Bate & Robert, 2006; Østervang et al., 2022; Palmer et al., 2019; Rafiei et al., 2025). PD is recognised as a valuable approach in efforts to improve the quality of healthcare services, where patients and healthcare professionals work together to identify challenges and co-create solutions (Bate & Robert, 2006; Masterson et al., 2022). By fostering mutual learning, PD allows participants to gain valuable insights contributing to design projects ranging from customised assistive technologies in rehabilitation services (Howard et al., 2024) to large-scale, cross-site projects aimed at improving the transfer of patient information between hospitals (Donetto et al., 2015).

Few examples exist in the literature of using PD to address sustainability in healthcare. One such attempt is by Jones and Arun Kumar (2023), who facilitated a workshop with design experts in healthcare and sustainability to co-create intervention strategy maps. Here, systemic design tools supported cross-disciplinary dialogue and the identification of potential leverage points for sustainable interventions.

Game-based Tools as Participatory Methods

The use of various design tools and objects - such as mock-ups or scenarios - plays a central role in facilitating PD processes (Simonsen & Robertson, 2013). These objects can carry inscribed knowledge and act as shared reference points that mediate between actors with differing perspectives and concerns (Pedersen et al., 2020). As such, they are particularly effective in processes where diverse actors come together to explore complex issues and co-create potential solutions (Pedersen & Brodersen, 2020).

Especially, design games are highlighted as a good way to organise PD processes, as they facilitate temporary rules for interaction between designers, users, and other relevant actors. In doing so, design games enable the negotiation of diverse perspectives and insights, fostering not necessarily agreement but alignment among the involved actors (Brandt, 2006).

Drawing on methodological insights from both design and policy games; a variation of games specifically tailored for supporting decision-making and strategic change in e.g. public health policy making (Spitters et al., 2017), Pedersen and Dorland (2025) present the concept of *negotiation games,* pointing towards the central aspect of negotiation in participatory game-based tools. Negotiation games constitute a valuable contribution within design-led research in healthcare contexts by promoting both "*co-exploration, co-analysis, co-design and alignment across sectors and professions.*" (Pedersen & Dorland, 2025, p. 5). Moreover, Pedersen and Dorland (2025) advocate for the use of the Staging Negotiation Spaces framework (Pedersen, 2020) in the development and facilitation of negotiation games, to foster meaningful dialogue among diverse actors and to align differing concerns within the healthcare system.

In summary, the implementation of sustainability in healthcare is impeded by a range of cultural, cognitive, and structural barriers highlighting a gap between sustainability ambitions and embeddedness in healthcare practices. PD and the use of collaborative tools such as negotiation games emerges as a promising methodological approach to overcome these barriers by actively involving healthcare professionals, patients, and other stakeholders in co-design processes.

To address the need for professional involvement and interdisciplinary coordination, the game The Path to the Climate Jewels offers an approach to bridging this gap. The game is considered as a negotiation game seeking to operationalise sustainability through facilitated collaboration, translating abstract sustainability goals into actionable steps within the healthcare context.

In the next section, the research design of this thesis is presented, elaborating on the theoretical and methodological frameworks, which have shaped the research and analysis of how the use of the game support environmental sustainability transition in healthcare.

3 Research Design

This project adopts a qualitative case study approach to explore the research question. As depicted in Figure 5, the case study centres on The Path to the Climate Jewels, a game-based tool developed to support interdisciplinary collaboration and local action planning among healthcare staff. The use of the game is approached as a staged negotiation game (Pedersen & Dorland, 2025), a facilitated format that structures interaction while balancing openness and constraint, offering participants a clear framework for engagement, while allowing flexibility to shape content, priorities and outcomes.

The overall research approach combines theoretical and methodological perspectives from Participatory Design (PD) (Simonsen & Robertson, 2013), Staging Negotiation Spaces (SNS) (Pedersen, 2020) and Arenas of Development (AoD) (Jørgensen, 2012; Jørgensen & Sørensen, 2002), each contributing distinct yet complementary insights.

PD serves as the foundation for engaging healthcare staff as active contributors in shaping sustainability transition, hence it guides the study's collaborative orientation and commitment to contextual engagement (Simonsen & Robertson, 2013).

The SNS framework plays a dual role: It serves both as a theoretical perspective for analysing the use of the game as a carefully staged space of collaboration and negotiation, and as a methodological framework guiding how the empirical work in the field has been carried out (Pedersen, 2020; Pedersen & Dorland, 2025).

Finally, AoD provides a strategic perspective of how competing concerns and actor constellations condition and interact with the use of the game (Jørgensen, 2012; Jørgensen & Sørensen, 2002).

In this study, the unit of analysis is the situated use and facilitation of the game in practice, specifically how healthcare staff engage with the tool to reflect on, coordinate and initiate sustainability actions. The unit of design is likewise focused on the game's use, including how it is staged and embedded within Region H's hospitals. While the material format of the game was finalised prior to the study, the research aims to inform and refine its practical application through recommendations for staging and facilitation.

Together, these perspectives enable a nuanced exploration of how the use of a game-based tool within hospital settings supports the translation of sustainability goals into coordinated action.

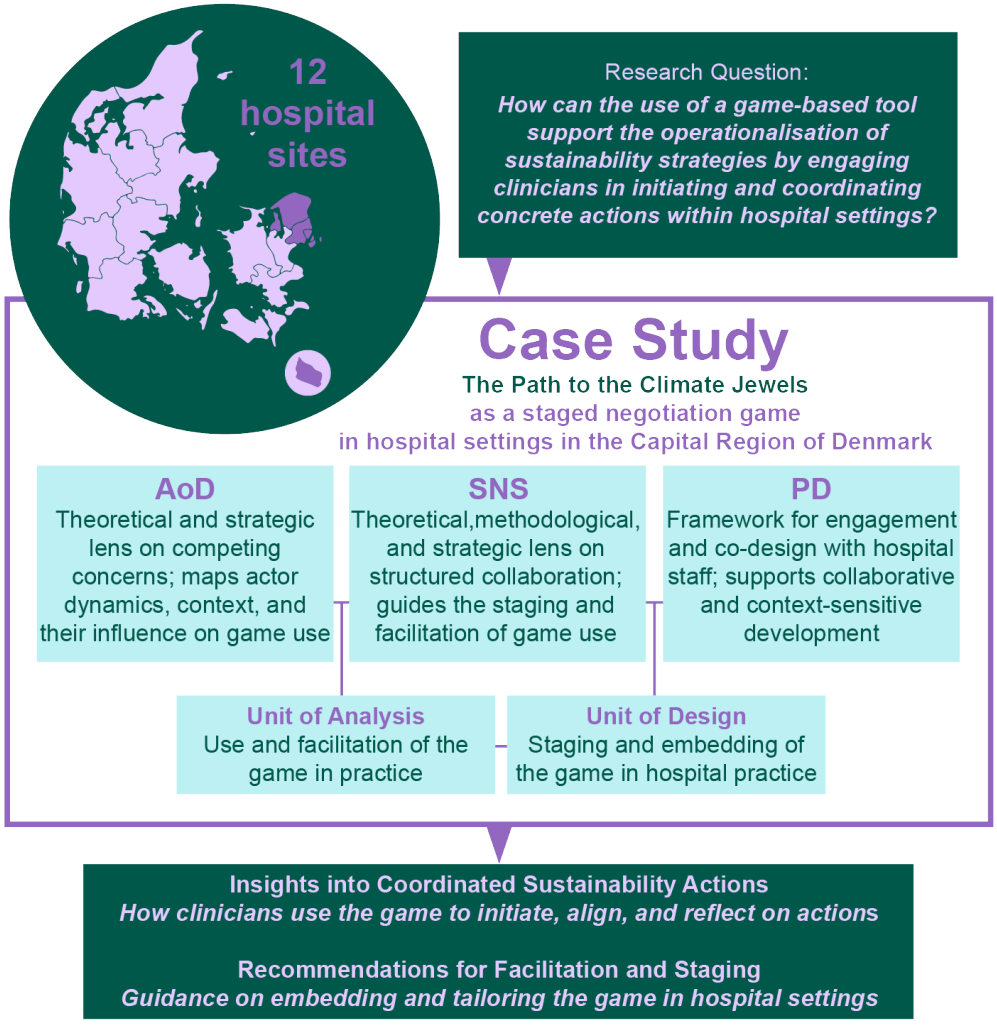


Figure 5: Research Design

3.1 Theoretical Framework

The study draws on two complementary frameworks, Staging Negotiation Spaces (SNS) (Pedersen, 2020; Pedersen et al., 2022) and Arenas of development (AoD) (Jørgensen, 2012; Jørgensen & Sørensen, 2002), to analyse how the use of a game-based tool can support environmental sustainability transition in clinical healthcare contexts. While serving different analytical purposes, both frameworks draw on Actor-Network Theory (ANT) and share a relational, situated perspective on socio-technical change - emphasising the agency of material objects (Law, 2008).

ANT offers a relational lens through which socio-technical change is understood as an ongoing process of assembling, negotiating and stabilising *heterogeneous networks of human and non-human actors* (Callon, 1986b; Latour, 1987; Law, 2008). Change unfolds through *translation*, the process by which actors' concerns, interests and relations are continuously reshaped as networks evolve and aim to stabilise (Callon, 1986a; Law, 2008). *Material semiotics* emphasises that meaning and matter are entangled, so that artefacts and texts do not simply represent ideas but participate in assembling realities through their situated materiality (Law, 2008). From this perspective, *intermediary objects* provide a way to understand how material artefacts mediate, transform and stabilise relationships within complex actor-networks (Vinck, 2012; Vinck & Jeantet, 1995).

Arenas of Development

The AoD framework extends ANT's relational approach by introducing a spatial dimension (Jørgensen & Sørensen, 2002). Rather than focusing on individual networks, AoD offers a broader analytical scope by examining delimited *arenas*, as socio-material spaces where multiple *actor worlds* co-exist, interact and compete around shared, though often contested, problem framings - *matters of concern* (Jørgensen, 2012; Jørgensen & Sørensen, 2002).

Actor-worlds refer to actor-networks that are held together not only by socio-material connections, but also by shared narratives and translations, highlighting the symbolic work needed to maintain internal coherence (Callon, 1986b; Jørgensen & Sørensen, 2002). They constitute coherent socio-material configurations in which each element, human or non-human is assigned a distinct role and place, thereby creating a structured 'world' around a particular problem or concern (Callon, 1986b). These concerns are not pre-given facts, but *matters of concern*, issues that matter to specific actors, bring them together in joint engagement and must be maintained and cared for to persist and remain relevant (Latour, 2008).

A *development arena* is a delimited socio-material space that holds together the heterogeneous settings, actors, artefacts, knowledge, visions, and relations shaping a particular context of *change* (Jørgensen & Sørensen, 2002). It is not tied to a specific location, but is composed of dispersed localities, both cognitive and physical, held together through the ongoing process of negotiation, translation and alignment (Jørgensen, 2012). Within a development arena, multiple actor-worlds may coexist, interfere or compete, each seeking to stabilise its framing of what matters and what should be done (Jørgensen & Sørensen, 2002).

Consequently, a development arena is a dynamic, temporally fluid space, whose boundaries take shape as actors perform, stabilise or challenge existing relations, making them useful for analysing transitions as situated and contested processes (Jørgensen, 2012).

The use of the AoD perspective has enabled a conceptual division of the field into distinct actor-worlds and an analytical understanding of how each introduces specific problem framings, logics, and visions

into the arenas of patient care and hospital climate transition. These concerns shape actions across arenas and influence how sustainability efforts unfold in hospital settings.

A key strength of the AoD perspective is its ability to trace tensions between arenas, such as treatment and green transition and to show how concerns are articulated, stabilised, and sometimes clash. This has supported both mapping and navigating the complex healthcare landscape into which the game is introduced.

Using the concept of the development arena, we examine how strategic interference is configured and how this positioning invites and mobilises relevant actors to engage with the game and negotiate concerns. This makes AoD particularly useful for examining the game's performance in context, where multiple healthcare actor-worlds interact, challenge one another, and shift the boundaries of established arenas. It helps us understand how the game brings actor-worlds into dialogue, sometimes reinforcing, sometimes disrupting them.

Finally, AoD offers a way to navigate transitions-in-the-making and inform strategic design interventions by identifying key actors and their driving concerns (Jørgensen, 2012; Pedersen & Clausen, forthcoming). This has enabled the analysis not only of the game's role in climate efforts but also of how sustainability strategies are translated into shared, coordinated action.

Staging Negotiation Spaces and Negotiation Games

SNS provides an analytical framework for understanding and shaping collaborative design processes as situated and socio-materially embedded negotiations (Pedersen, 2020; Pedersen & Dorland, 2025). The framework builds on insights from both ANT and PD, combining attention to relational complexity, material mediation, and democratic ideals of collaboration - particularly the concepts of translation, negotiation of concerns and intermediary objects (Pedersen, 2020).

SNS conceptualises *negotiation spaces* as situated, temporally bounded socio-material configurations, deliberately staged to facilitate interaction between actors and artefacts (Pedersen, 2020; Pedersen et al., 2022). Negotiation is not necessarily aimed at consensus, but at fostering collaboration and alignment between diverse actors, and is mediated not only through spoken dialogue, but also through material artefacts, such as game elements, to help surface, translate and align concerns and foster mutual learning (Pedersen et al., 2022; Pedersen & Dorland, 2025). These spaces are typically configured through the interplay of four key elements: *a facilitator, artefacts such as games, the material arrangement of the setting, and selected actors* (Pedersen & Dorland, 2025).

Within this configuration, the facilitator often plays a dual role, both setting the stage and guiding the process through a series of *staging moves*, taking strategic decisions about what concerns to address, who to involve, and how material artefacts are inscribed with meaning to enable dialogue (Pedersen, 2020; Pedersen & Dorland, 2025). These staging moves include more specifically: A) *interpreting and (re)framing* the situation to identify relevant issues and shape the focus of the negotiation. B) *Producing objects* by inscribing concerns into physical props that support dialogue and mutual learning. C) *Inviting actors and facilitating* their participation in the negotiation ensuring inclusive and situated engagement (Pedersen & Dorland, 2025). Here, the facilitator plays a central role by navigating rather than controlling the negotiation space, balancing structure and openness through the circulation of objects, improvisation and mediation between competing concerns to foster participation and enable collective reframing (Pedersen, 2020).

Within the SNS framework, negotiation games are understood as structured yet flexible formats that help facilitate situated collaboration and mutual learning among actors by providing a shared material framework, often composed of game elements, that enable participants to articulate, exchange and reframe concerns through guided interaction (Pedersen & Dorland, 2025). Negotiation games vary in purpose and form, including: *Configuration games*, used for co-exploration, co-analysis and co-design, to help participants map systems, identify roles and iteratively configure new arrangements. *Prioritisation games*, designed for co-analysis, to support a ranking of concerns or initiatives. *Process-oriented games*, aimed at co-designing solutions such as care pathways through sequenced facilitation (Pedersen & Dorland, 2025).

In this study, the use of The Path to the Climate Jewels is analysed as a staged negotiation game. Hence, the game sessions become staged negotiation spaces. The game is best understood as a hybrid negotiation game, combining the game types over different phases of the game. By analysing the use of the game through this lens, the study enables a nuanced understanding of how it can be staged and facilitated to foster clinician engagement and support the initiation and coordination of concrete sustainability actions.

Strategic Navigation with a Combined Framework

Finally, combining the SNS framework with the AoD perspective enables a layered understanding of how concerns are negotiated, enacted and anchored within complex healthcare settings. While SNS focuses on the local dynamics of collaboration, how concerns are surfaced, negotiated and stabilised through facilitation and material mediation - AoD situates these negotiations within a broader arena shaped by multiple co-existing actor-worlds with diverging concerns, logics, and priorities (Jørgensen, 2012; Jørgensen & Sørensen, 2002; Pedersen, 2020; Pedersen et al., 2022; Pedersen & Clausen, forthcoming).

Negotiation spaces not only surface varying concerns but also foster reframing and co-analysis, whereby actors inscribe concerns into material artefacts that help stabilise new problem framings and support strategic enrolment in the development arena (Pedersen & Clausen, forthcoming).

In the analysis, these perspectives are brought together to explore how two contrasting workshop constellations strategically stage negotiation between Arena 1 (healthcare delivery) and Arena 2 (green transition). While both workshops employ The Path to the Climate Jewels, they differ markedly in purpose, participant composition, and framing, resulting in distinct forms of negotiation, each aimed at producing intended displacements within the healthcare arena.

Using SNS, it is analysed how these negotiations unfold through three interrelated staging moves: (1) how concerns are framed in relation to clinical priorities or exploratory ambition, (2) how collaboration is invited and facilitated across roles and hierarchies, and (3) how concerns are inscribed into material outputs such as guidelines and visual tools. These moves shape the temporary negotiation spaces and influence what becomes actionable and strategically displacing.

Through this combined lens, it is shown how the configuration of each workshop - its participants, facilitation, and material scaffolding - not only enables situated negotiation, but also determines how and where displacement between arenas becomes possible.

3.2 Research Methodology

This thesis is situated within the field of Participatory Design (PD) and draws on the framework of Staging Negotiation Spaces (SNS) to explore how participatory tools can support sustainable transitions in healthcare. The study adopts a qualitative, design-based case study approach that aims to generate situated knowledge through intervention and reflection. The case study investigates the use of The Path to the Climate Jewels as both a situated collaborative design intervention and an empirical site for investigation. Rather than studying change from a distance, this research involves shaping and studying practice through the co-development of the staging and facilitation of the game.

PD provides the methodological foundation for this thesis by positioning design as a collaborative practice-based investigation, where research and design are integrated in iterative, real-world settings. Fundamentally, PD focuses on enabling those affected by change to take part in shaping it, through *mutual learning, situated experimentation and shared reflection* (Simonsen & Robertson, 2013).

In this study, PD has not only informed the game's co-design history but also guides the engagement with its use as a collaborative and context-sensitive process. Here, design is not about developing the game itself but about how it's use are able to shape clinical and organisational practice towards sustainability in ways that are meaningful, inclusive and actionable. The game becomes a material mediator for engaging healthcare staff in identifying and enacting sustainability initiatives within their own local context.

In addition to providing an analytical perspective, the SNS framework (Pedersen, 2020) has also informed the methodological approach to fieldwork throughout the project. A series of meetings with the Section's project managers and other actors, held for various purposes across the project period, were shaped by an awareness of how staging moves can support constructive dialogue. Knowledge from SNS informed decisions about what to bring into the room or online meeting, how to engage participants, and how reframings of concerns could emerge through interaction.

This methodological awareness also shaped the design team's contribution to the planning and facilitation of game workshops, where the use of staging moves presented in the SNS framework played a more explicit role in structuring interaction and supporting alignments between game participants.

Building on Former Projects

This study's empirical work takes place during the third and final phase of a broader design research process, conducted in collaboration with Region H. This process is structured through an extended version of the Double Diamond model (Design Council, n.d.) in Figure 6 (next page), which showcases how the three phases form a continuous process of insight, development, implementation, and use.

The first phase, an earlier project from spring 2024, conducted by the design team, closely investigated sustainability challenges in clinical practice through ethnographic fieldwork (Thøstesen, et al., 2024). While separate, it provided firsthand insights into barriers that later informed the design process. The second phase, conducted as an internship in the Section in autumn 2024 by two members of the design team, began by discovering and defining implementation challenges from the perspective of the project managers, tasked to support the implementation of hospital- and employee-led climate efforts. In response to these challenges, a co-design process was

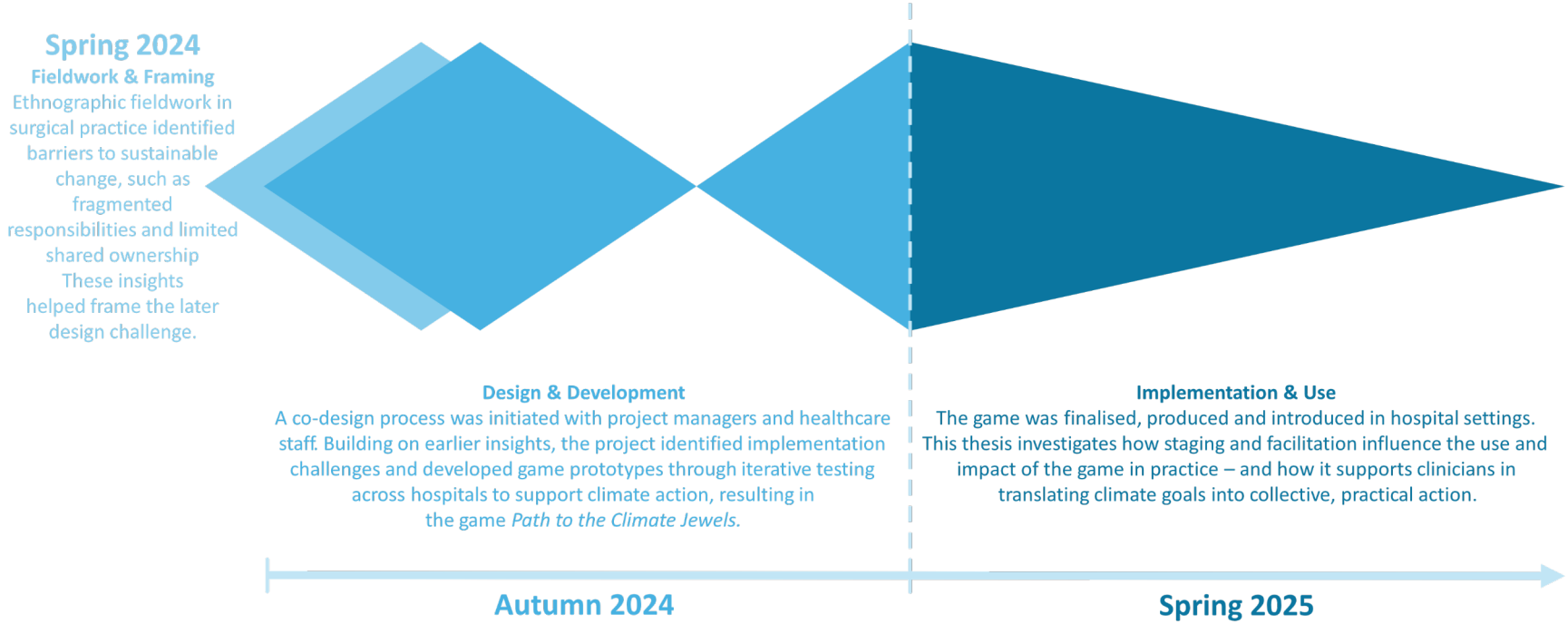


Figure 6: Extended Double Diamond model illustrating the three phases of the collaborative design process

carried out with the project managers, followed by iterative prototyping and testing with clinical healthcare staff in both types of climate efforts. The goal was to develop a game-based tool grounded in the clinical realities and capable of supporting clinicians in coordinating and initiating concrete action in sustainability efforts. The outcome was The Path to the Climate Jewels (Vogel & Gilbu, 2025).

The game was finalised and sent into production in February 2025 as part of the initial activities in this thesis project. However, as the game is now being implemented in hospital settings, the main objective of this thesis is to explore its use and evaluate how it can be staged and facilitated to mobilise clinicians in initiating and coordinating concrete sustainability actions in practice.

The Design Team's Role

The transition between phases also marks a shift in the design team's role, from active co-designers to supportive co-facilitators working alongside section project managers, who now lead the game's implementation and primarily facilitate its use. This shift reflects an intention to foster both ownership and the development of facilitation competencies among the project managers, ensuring they are well-equipped to continue using the game and adapting the facilitation beyond the duration of this collaboration.

During the thesis, the design team contributed to the production of the game and development of facilitation materials while gradually stepping back from a leading role to one of support and sparring in

staging and facilitating the workshops. This reflects the project's temporal positioning at the end of the extended design collaboration. As the collaboration concludes, the further development of the use of the game will be carried forward by the Section.

Methods and Data Collection

The empirical material for this study has been generated through a series of activities carried out between February and May 2025, during the third and final phase of the broader design process. The primary field activities have consisted of two game workshops conducted at different locations with different purposes, supported by preparatory meetings and follow-up conversations with section project managers and other relevant actors, such as the Head of the Section, and the Green2030 Management. The game workshops have been planned in collaboration with the section's project managers, who have set up the workshops and invited the participants.

Each workshop has included gameplay, though in different configurations as visualised in Table 1 and Figure 7:

Figure 7: Game settings in workshop 1 (left) and workshop 2 (right)

Table 1: Workshop configurations

	Game workshop 1	Game workshop 2
Date	28th March	9th April
Type of climate effort	Hospital-led	Employee-led
Location	Hospital meeting rooms	Conference room (location outside hospital setting)
Number of game sessions	2	6
Number of participants	(divided in two rooms) <u>Room 1 (Obstetrics):</u> 9 gameplayers from lead and partner hospital (doctors, midwifes and nurses) 4 observers 1 facilitator 1 assisting facilitator <u>Room 2 (Gynaecology):</u> 10 gameplayers from lead and partner hospital (doctors, midwifes and nurses) 3 observers 1 facilitator 1 assisting facilitator	(in one large conf. room) 24 gameplayers (divided in 6 groups) 6 table facilitators 1 assisting facilitator 1 floating facilitator
Duration	2 Hours	1.5 Hours

The two workshops targeted each type of climate effort; hospital-led and employee-led. The first workshop has been held at the lead hospital for the climate effort #12 on reducing consumption in patient pathways related to childbirth, gynaecology, and obstetrics. It has included game participants from both the lead and partner hospital, spanning multiple clinical professions, as well as the hospital's green coordinator. The project managers have acted as primary facilitators, while the design team has supported the facilitation as needed, based on the facilitators' preferences and situational demands. Otherwise, members of the design team have participated as observers, documenting the session to support later analysis.

The analysis presented in this thesis focuses primarily on data from one of the two game sessions (Obstetrics) during workshop 1. The session has been selected to allow for in-depth analysis of a single hospital-led climate effort. Both sessions in the workshop had similar formats, participants, facilitation and outcomes, and the chosen session is representative of the dynamics observed across both.

Workshop 2 - targeting the employee-led climate effort - has been conducted as part of the training programme for healthcare staff to become Green Ambassadors. It has involved participants from non-clinical and clinical professions, representing different hospitals and departments. In this workshop, four project managers and the design team have collaborated as primary facilitators across six parallel game sessions. Two members of the design team served as table facilitator, each guiding a group, while the third acted as a floating facilitator, supporting time management and responding to needs across sessions. Compared to the first workshop this format has allowed for broader coverage but less depth within each individual session. Moreover, the purpose of the workshop has differed significantly. While workshop 1 focused on generating concrete action plans for the working group of the hospital-led climate effort, the second workshop has primarily aimed to support participants' learning and to demonstrate how the game could be used in their own future practice. As a result, material from workshop 2 has been used to identify patterns in how the game was received, how participants engaged, and what conditions appeared to support or constrain participation, rather than analysing a single game process in depth.

To complement the observation and facilitation insights, participant feedback has been collected during and after the game workshops. After each session, participants have been asked a variation of the question: *"Can/Has the game The Path to the Climate Jewels made your work with the green transition more concrete and action-oriented?"* Due to time constraints, quantitative feedback was collected using a "stand up if you agree" format, which also encouraged immediate verbal reflections. In Workshop 2, participants furthermore responded to the open-ended question "What is your key takeaway from the game session?" as part of a broader Green Ambassador training questionnaire. Additional insights were gathered through informal conversations during and after the workshops, offering further perspective on how the game was received and interpreted.

In addition, to the game workshops, several planning and reflection meetings have been held with project managers before and after each workshop. These meetings have served as collaborative spaces for refining facilitation formats, discussing participant feedback and adjusting materials and framings. Moreover, a game launch event has been held in May, during which the project managers formally introduced the game to the regional network of green coordinators. The event also included a presentation by a participant from workshop 1, who shared how the game session had influenced their ongoing work in the climate effort, including outcomes and reflections of participation. Table 2 (next page) provides an overview of these field interactions, including the majority of collaborative activities related to the production of the game and its use.

Table 2: Overview of field interactions			
Field interaction	**Date**	**Format**	**Actors**
Morphology workshop for final detailing of the game	06/02/2025	Workshop	All (5) project managers, 1 representative from Green2030 management
Aligning expectations for thesis project	06/02/2025	Meeting	Head of the Section
Co-creating a plan for game production	06/02/2025	Meeting	1 project manager (primary contact person)
Presenting offers (from six suppliers) and negotiating budgets for game production	19/02/2025	Online meeting	Representative from Green2030 management
Selecting suppliers and number of games	25/02/2025	Online meeting	Representative from Green2030 management, 1 project manager, head of the Section
Final clarification of budget and suppliers	26/02/2025	Online meeting	Head of the Section
Development of examples for layers in the game	04/03/2025	Online meeting	4 project managers
Development of case example for game rules	11/03/2025	Phone call	1 project manager
Review of game rules	11/03/2025	Phone call	1 project manager
Presentation of the final game and implementation strategy	26/03/2025	Workshop	4 project managers, head of the Section, head of Green2030
Game workshop with gynaecology	28/03/2025	Workshop	11 healthcare professionals (doctors, midwifes and nurses), 1 hospital data specialist, 1 environmental data specialist, 1 project manager

Table 2: Overview of field interactions (continued)			
Field interaction	**Date**	**Format**	**Actors**
Game workshop with obstetrics	28/03/2025	Workshop	11 healthcare professionals (doctors, midwifes and nurses), 1 green coordinator, 1 project manager
Workshop evaluation	28/03/2025	Informal discussion	2 project managers (facilitators), 1 environmental data specialist (observer)
Planning game session in the training programme for green ambassadors	03/04/2025	Online meeting	2 project managers
Preparation of game session in the training programme for green ambassadors	08/04/2025	Online meeting	3 project managers
Inputs for game presentation at conference	09/04/2025	Phone call	1 Project manager
Game workshop in training program	09/04/2025	Workshop	24 green ambassadors, all 5 project managers
Survey, evaluation of the game in training programme	09/04/2025	Survey	24 green ambassadors
Evaluation of game session in training programme	10/04/2025	Mail	All 5 project managers
Evaluation of game session in training programme	22/04/2025	Online meeting	All 5 project managers
Game launch event	13/05/2025	Event	All 5 project managers, 12 green coordinators and staff from hospital green teams

Empirical data have been collected through a various documentation format including field notes, photographs, audio- and video recordings, email exchanges and evaluation reflections. A selection of these materials is included in the appendices to support transparency and contextual understanding.

Workshops and meetings have been audio recorded with participants' verbal consent to support analytical accuracy. Documentation activities have been carried out with respect for the participatory setting, aiming to minimise disruption and to support a safe and engaged atmosphere. Written empirical material has been anonymised in the thesis to ensure participant confidentiality.

Supplementary materials from earlier phases of the broader design process also informed the study. This includes project reports from the spring 2024 fieldwork (Thøstesen, et al., 2024) and the autumn 2024 internship (Vogel & Gilbu, 2025), which have informed the understanding of key challenges and the game's contextual development. Selected outputs from these phases, such as summaries and synthesis sheets, are included in the appendices to support the analysis.

This methodological approach enables the study to contribute with both practical design recommendations for staging and facilitating game-based tools and analytical insights into how sustainability transitions can be supported within healthcare organisations.


POLITIK
Dette lag omfatter beslutninger og retningslinjer, der påvirker sundhedssektoren – fra lederniveau til nationale og globale reguleringer. Det dækker bl.a. hygiejnekrav, budgetter, procedurer og love, som alle har betydning for implementering af klimaindsatser.
POLITISK MULIGHED/BARRIERE
VIP kan let tilkaldes
Netværk (læger) inddrages.
OBS generisk SP-sakko.
Læge
Navn: HARIANNE + LENE (NOH)
Aktør: ÆFDL JDM
Navn: Mette-olivia
TEKNOLOGI
Dette lag omfatter de teknologiske systemer og den infrastruktur, der understøtter hospitalsdriften, herunder apparater, computersystemer og teknologiske processer som f.eks. sterilisation. Det inkluderer også adgang til vand, el og andre ressourcer samt logistik og transportløsninger, der sikrer effektiv og bæredygtig håndtering og behandling af udstyr, forsyninger og patienter.
TEKNOLOGISK MULIGHED/BARRIERE
SP. AKTØR. /CIMT.
Navn: Dosjne (Plakat)
Aktør:
Navn: Andreas fra CIMT
Navn: Maja W jdm + SP-person
SÅDAN SPILLER DU
ADFÆRDSMÆSSIG MULIGHED/BARRIERE
Sparring - udnytte erfaring.
Konference ved "normale fund"
Navn: Charlotte + Frederikke
Navn: Marianne
Veien til klim

4 Analysis

4.1 Analysing the Intersecting Arenas of Healthcare Service and Green Transition

This section deploys the perspective of Arenas of Development (AoD) (Jørgensen, 2012; Jørgensen & Sørensen, 2002) to analyse how different actor-worlds constitute two interacting arenas: 1) *Diagnosis and treatment of patients in the Region's hospitals* and 2) *Green transition of hospitals* prior to the implementation of the negotiation game The Path to the Climate Jewels (Illustrated in Figure 8 on next page). In this context, the term green transition refers to the environmental sustainability transition of healthcare services, but follows the terminology used by Region H. By identifying the actor-worlds operating within the two arenas and understanding their shared matters of concern, the analysis examines the challenges that influence the green transition of Region H's hospitals.

Arena 1: Diagnosis and Treatment of Patients in the Region's Hospitals

To effectively intervene in the current healthcare arena, it is necessary to first examine the actors that articulate and enact its central matter of concern. This arena comprises a heterogeneous constellation of actors who collectively sustain Region H's healthcare system. While these actors are united by a shared concern - *delivering healthcare services to regional citizens* - they pursue and enact this concern through different practices and configurations. As a result, they are engaged in three distinct *actor-worlds*, each structured around a particular articulation of the shared matter of concern. These actor-worlds are composed of heterogeneous assemblages of human actors - such as healthcare staff and managers - and non-human actors, including IT systems, guidelines, and medical equipment. In their collective efforts, these actor-worlds foreground three specific concerns: 1) *ensuring patient safety and treatment quality,* 2) *ensuring efficient use of time and resources*, and 3) *improving coordination among healthcare staff*. The configuration and dynamics of each actor-world are elaborated in the sections that follow.

Concern 1: Ensuring Patient Safety and Treatment Quality

One of the most deeply rooted and universally prioritised concerns in clinical practice is ensuring patient safety and the quality of treatment, as depicted in Figure 9. Across departments, clinicians articulate this as their core responsibility, embedded in both professional identity and everyday practice. Nowhere is this more evident than in high-risk environments such as surgical units, where sterility, precision, and vigilance are paramount: "*Ensuring the field is*

Figure 9: Actor-world sharing concern 1 in the first arena

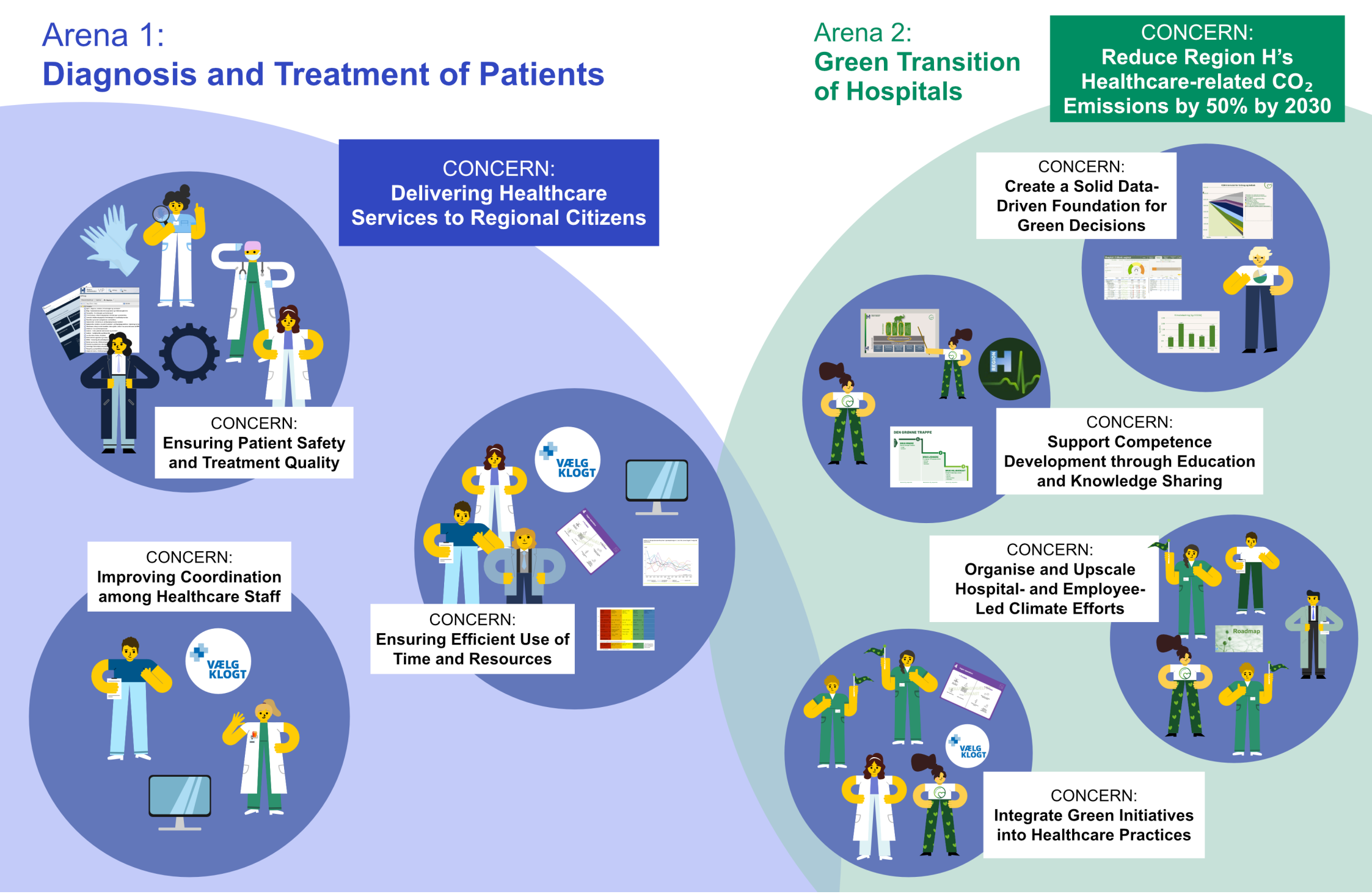


Figure 8: Two interacting arenas: 1) Diagnosis and treatment of patients in the Region's hospitals and 2) Green transition of hospitals prior to the implementation of the negotiation game

sterile is one of our core areas," noted a surgical nurse (Thøstesen, et al., 2024, p. 43). Even subtle signs in high-risk patients must be taken seriously: *"We can't afford to take a relaxed approach "just" because* [only] *the blood pressure is high."* (Deputy Head Midwife, pers. comm., 28.03.25; App. D).

This actor-world is sustained by frontline professionals like nurses, doctors, midwives, and infection control nurses who rely on both human expertise and an extensive network of non-human actors. Single-use sterile products, medical technologies, hygiene protocols, and clinical guidelines are not merely tools; they are stabilising agents that ensure clinical control and uphold safety norms.

Medical device manufacturers also shape the actor-world by marketing their innovations as solutions to enhance patient safety. This connection between safety and new technology influences clinical behaviour. As one consultant explained, "*Every time some new thing comes along, like an intramedullary nail (...) suddenly there are a whole lot of patients who need surgery*" (Thøstesen, et al., 2024, p. 34). Such dynamics reinforce a culture of always striving for the highest possible treatment standard - an ethos echoed by a head nurse working with an elective surgical team: "*They want to offer the best possible care (…) and that means using additional instruments.*" Yet, she added, "*That's a hard one to push back on,*" acknowledging the challenge of contesting what is framed as the most advanced or safest care (Pers.comm., 19.11.24; App. C).

These strong associations between patient safety and product-intensive, high-tech care are precisely what makes this actor-world especially sensitive to green transition initiatives. Efforts to reduce single-use products or shift toward more sustainable materials can raise alarms about hygiene, sterility, and patient trust. Infection control nurses often act as gatekeepers in this regard, seeking to ensure that sustainability efforts do not compromise safety: "*It's about how we can make all of this work* [green transition] *without compromising patient safety*" (Infection Control Nurse, 28.03.25; App. D). Reusable products can create uncertainty. Even small changes, like removing paper from exam beds, can cause doubt: *"They might wonder, 'Is it clean now?'"* (Green Ambassador, pers. comm., 06.11.24; App. C).

Professional autonomy is another linchpin in this actor-world. Doctors, in particular, are legally and ethically accountable for outcomes. *"In the end, it's the doctor who holds the legal responsibility if something goes wrong,"* a chief consultant states (Pers.comm., 28.03.25; App. D). This responsibility gives clinicians a strong voice in shaping how changes are evaluated and whether they are adopted. Senior consultants also act beyond the clinic, participating in procurement, policy, and guideline development to ensure system-level decisions reflect clinical safety standards: *"We have senior consultant meetings where we discuss these kinds of things"* (Chief Consultant, pers.comm., 28.03.25; App. D).

Altogether, this actor-world is robust but also resistant to change that appears to threaten its stabilising structures. Safety is non-negotiable, and when sustainability measures are not clearly aligned with clinical logic and accountability, they can be perceived as intrusions rather than innovations.

Concern 2: Ensuring Efficient Use of Time and Resources

This actor-world emerges in direct response to the pressures facing the healthcare system: rising patient numbers, and chronic staffing gaps (Region H, 2024a; Sundhedsaftalen, 2023). Here, the concern for efficiency is operationalised through a tightly knit constellation of human actors; clinicians, department managers, coordinators, and non-human actors, including digital task systems, scheduling tools, triage protocols and institutional performance metrics. See Figure 10.

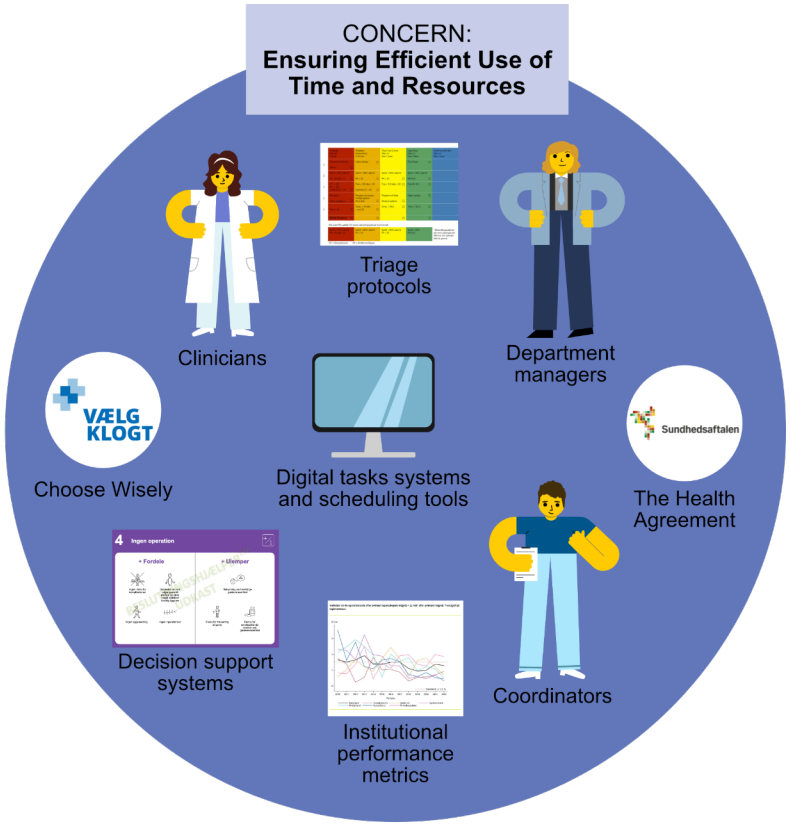


Figure 10: Actor-world sharing concern 2 in the first arena

In practice, clinicians must constantly navigate time pressure, multitasking and decision-making within tightly scheduled routines. *"What's important to me is that we prioritise using our resources - and our midwives' time - well,"* explained one midwife (Pers.comm., 28.03.25, App. D).

Regional policy documents similarly reframe healthcare delivery as a question of system efficiency. The health agreement explicitly calls for a rethinking of task execution to meet rising demand with finite resources: *"The healthcare system is under increasing pressure (…) task execution must be rethought to ensure efficient use of resources"* (Sundhedsaftalen, 2023, p. 6).

Yet despite the system's ambition, the everyday reality is that clinical routines leave little time for participation in reform efforts or new initiatives. As one green ambassador stated during testing, "*I feel ready to try new approaches and be challenged a bit. But the biggest obstacle is time - that's what's always in short supply*" (Green Ambassador, pers.comm., 06.11.24; App. C).

Systemic initiatives such as Choose Wisely *(Vælg Klogt)* aim to address resource constraints by encouraging clinicians to reconsider unnecessary or low-value treatments. The programme directs attention towards interventions with clear clinical benefit, supporting a model of care that is both evidence-based and patient-centred (Vælg Klogt, n.d.). Closely related are decision support tools, grounded in clinical evidence and approved by the regional clinical council. These facilitate shared decision-making by helping clinicians and patients reflect on whether a proposed treatment - often a resource-intensive option such as surgery - is truly appropriate. In many cases, such interventions carry risks and burdens that may not align with the patient's best interests (Center for Patientinddragelse, n.d.).

Decision support tools can ease the tension between resource use and patient safety by showing that the best care is not always the most invasive. But rethinking treatment pathways or developing such tools requires multidisciplinary teams with both clinical insight and authority. As one deputy head midwife noted, involving the right people is a major undertaking: *"You can't just do that on a random afternoon… there's an emergency caesarean, someone is off sick, and you have to cover shifts"* (Pers.comm., 13.05.25, App. D). This illustrates how the concern for efficiency, while widely shared, is often difficult to enact at the organisational level without structural space, time, and authority to support it. Like patient safety, it becomes not just a value but a system-wide constraint that shapes how clinical care is delivered - and who is able to lead change within it.

Concern 3: Improving Coordination among Healthcare Staff

Coordination is a vital concern across clinical practice and a central mechanism for enacting both patient safety and the efficient use of time and resources, as depicted in Figure 11. In high-pressure environments such as surgical departments, coordination unfolds through tightly structured cross-disciplinary meetings held throughout the day. Nurses schedule operating theatre staff, senior doctors review the surgical plan, anaesthesiologists assess patient readiness, and daily conferences review and adjust upcoming activities (Thøstesen, et al., 2024).

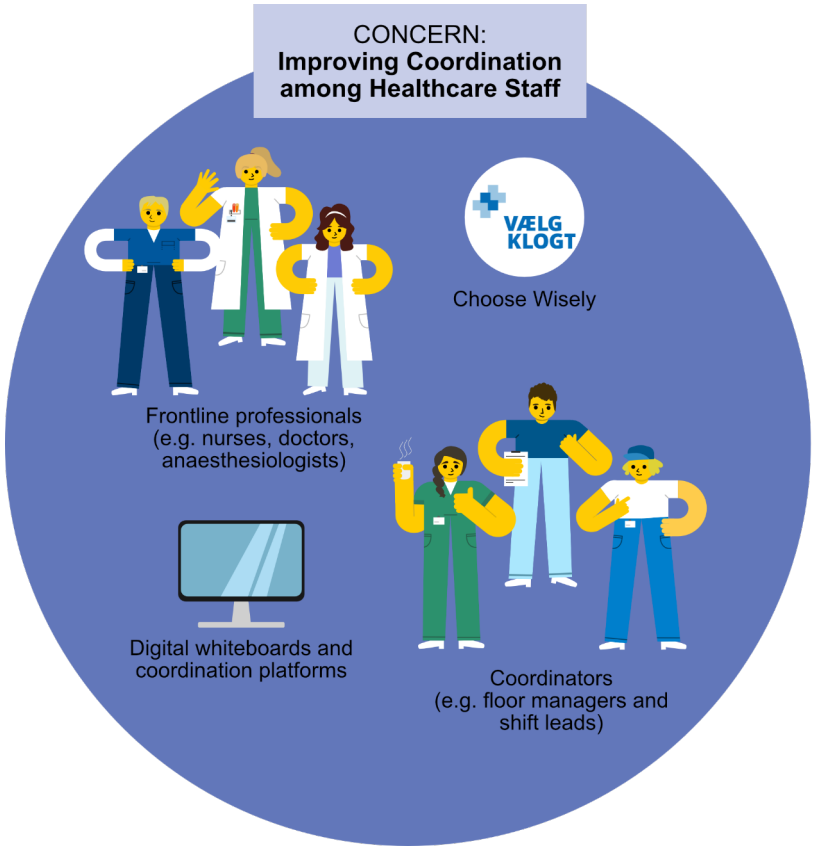


Figure 11: Actor-world sharing concern 3 in the first arena

Coordination is not confined to formal meetings. It is continuously enacted through handovers, shared routines, real-time decision-making, and informal communication among clinicians such as nurses, doctors, midwives, and coordinators. These situated actions prevent delays, reduce duplication, and ensure patients are guided smoothly through care pathways. But even with such systems in place, gaps emerge. As one coordinating nurse explained, *"Yes, you can end up taking the wrong ones* [instruments]. *They* [the surgeons] *can also have booked the wrong ones, and then we have set everything up, and then they come and say it's wrong. Then we have to put everything back and set the other ones up. That also happens"* (Thøstesen, et al., 2024, p. 30).

Such inefficiencies illustrate the high stakes of poor coordination - not just in terms of workflow, but also the waste of materials and staff time. In response, new coordination strategies are emerging. The 'Choose Wisely' initiative encourages professionals to re-examine the number of clinical touchpoints. In line with these thoughts, one chief midwife asked: *"If they're not showing any concerning signs, could some of these touchpoints be coordinated differently? (...) Are the same issues being discussed with different professionals?"* (pers. comm., 28.03.25, App. D).

The coordination actor-world is further stabilised by roles like floor managers and shift leads, who manage daily flow, and by non-human actors such as digital whiteboards and coordination platforms. These efforts, however, are not just about communication - they are tightly linked to capacity: *"That also ties into resources. And there's this need to ensure flow, because we've got so many patients coming through,"* one deputy head midwife remarked (Pers.comm., 28.03.25, App. D).

Despite fragmentation and siloed structures (Center for offentlig-privat innovation, 2022), clinicians continue to actively maintain coordination through adaptive use of tools, role-based responsibility,

and interprofessional collaboration. Coordination is thus not a background function; it is a central organising principle without which care delivery cannot be sustained.

Concluding Arena 1: Diagnosis and Treatment of Patients

Across its constellation of actor-worlds, Arena 1 is fundamentally oriented toward delivering timely, effective, and safe treatment to patients in Region H's hospitals. This shared matter of concern unites a wide range of human and non-human actors - from clinicians and managers to guidelines, IT systems, and medical technologies. Whether focused on patient safety, resource efficiency, or coordination, each actor-world helps stabilise and sustain the healthcare system's core function and concern; treatment delivery.

However, these actor-worlds are not without internal tensions. The pursuit of safety often drives an intensive reliance on single-use products and advanced technologies; the push for efficiency can marginalise long-term reflection and systemic change; and coordination, while crucial, is under constant strain from fragmented structures and time scarcity.

Taken together, these dynamics contribute to highly product- and resource-intensive practices that, while clinically justified, have significant environmental consequences. The cumulative effect is a healthcare system that - by virtue of how safety, efficiency, and coordination are enacted - is structurally unsustainable from a climate perspective.

Arena 2: Green Transition of Hospitals

Arena 2 emerges in response to a growing paradox; while healthcare systems are increasingly expected to reduce their climate impact, the dominant structures of clinical practice (Arena 1) remain materially and operationally intensive. This second arena, the green transition of hospitals, constitutes a distinct yet partially overlapping field of action. It is defined by new actor-worlds working toward the shared concern of reducing Region H's healthcare-related CO_2 emissions by 50% by 2030 - a political ambition formally adopted by the Regional Council in autumn 2023 (Region H, 2024b).

As visualised in Figure 8, Arena 2 overlaps only marginally with Arena 1. This limited overlap reflects a disconnection between high-level sustainability targets and their integration into everyday clinical routines. For many healthcare professionals, the green transition remains an externally imposed political agenda - well-intentioned but misaligned with the realities of patient care, time scarcity, and clinical accountability. Despite these tensions, a growing constellation of human and non-human actors - including project managers, green ambassadors, coordinators, clinicians, political councils, and strategic tools like roadmaps - are stabilising this new arena.

Four primary concerns structure the actor-worlds within Arena 2: 1) *organising and upscaling hospital- and employee-led climate efforts;* 2) *supporting competence development through education and knowledge sharing;* 3) *building a solid data-driven foundation for green decision-making;* and 4) *integrating climate initiatives into healthcare practices.*

Concern 1: Organise and Upscale Hospital- and Employee-Led Climate Efforts

This actor-world is anchored by the Green2030 Programme - a political and managerial initiative supported by the Section. See Figure 12. A central non-human actor, the Green2030 roadmap (Region H, 2024b), defines strategic priorities and distributes responsibility across hospital specialties. Lead and partner hospitals are designated to drive initiatives within these areas, minimising duplication, and promoting knowledge transfer and upscaling.

Hospitals are encouraged to self-organise but are supported by project managers and green coordinators. Steering groups - typically led by a "green director," supported by green coordinators, and composed of clinical and departmental managers act as coordinating nodes. These vary in maturity and often struggle to structure sustained climate efforts.

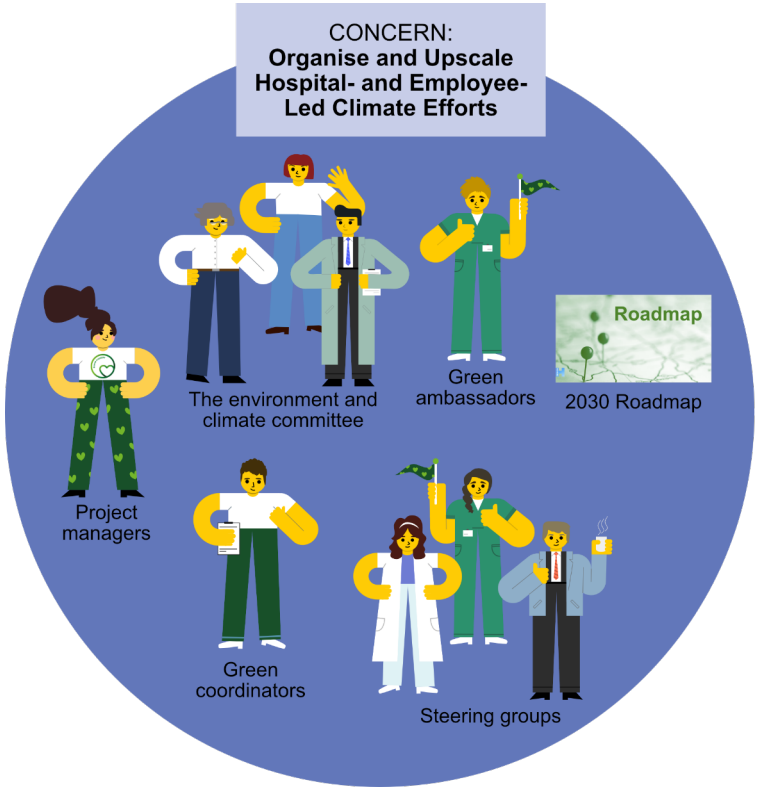


Figure 12: Actor-world sharing concern 1 in the second arena

As one head nurse explained; *"We're being asked to meet a lot of targets - but what tools are actually being provided to help us get there? It feels like we're having to invent a lot ourselves, and that takes time. Calculations and planning like this pull us away from core leadership tasks. Is there a way to get a clearer overview - where do we actually stand?"* (Pers,comm, 19.11.25, App C).

Project managers support coordination work through steering group participation, cross-hospital meetings, and guidance tools. Still, as one noted, *"It's really about structure (...) not how they organise themselves, but how they actually go about working with a climate initiative"* (Project Manager A, pers.comm., 25.09.24, App. A). Others echoed: *"They simply don't know where to start or how to move forward"* (Project Manager B, pers.comm., 25.09.24, App. A); *"They're full of good ideas (...) but then it's like they hit a wall"* (Project Manager C, pers.comm., 25.09.24, App. A).

This decentralisation creates both empowerment and isolation. Green ambassadors initiate small-scale changes - typically focused on materials and waste. These "employee-led climate efforts" are especially crucial in engaging clinical and non-clinical staff in meaningful, localised practices. While supported by green coordinators and project managers, these efforts are fragmented. As one ambassador reflected; *"You can end up feeling like a bit of a stranded ambassador out there"* (Green Ambassador, 06.11.24, App. C).

Mobilising across staff levels remains difficult: *"Sometimes it's the staff who are full of great ideas but don't have support from management. Other times, it's the managers (...) but they're struggling to get the staff on board"* (Project Manager, pers.comm., 25.09.24, App. A).

The need for tools that can guide the initiation and structuring of climate initiatives are further recognised by politicians in the environment and climate committee (Miljø- og klimaudvalget, 2025).

Concern 2: Support Competence Development through Education and Knowledge Sharing

This actor-world recognises that staff knowledge and engagement are prerequisites for green transition. See Figure 13. The Section and

project managers activate this concern through structured training and knowledge-sharing. A constellation of non-human actors is mobilised within the temporary space of the Green Ambassador Education; a three-day programme designed to equip clinicians with tools and strategies for green action.

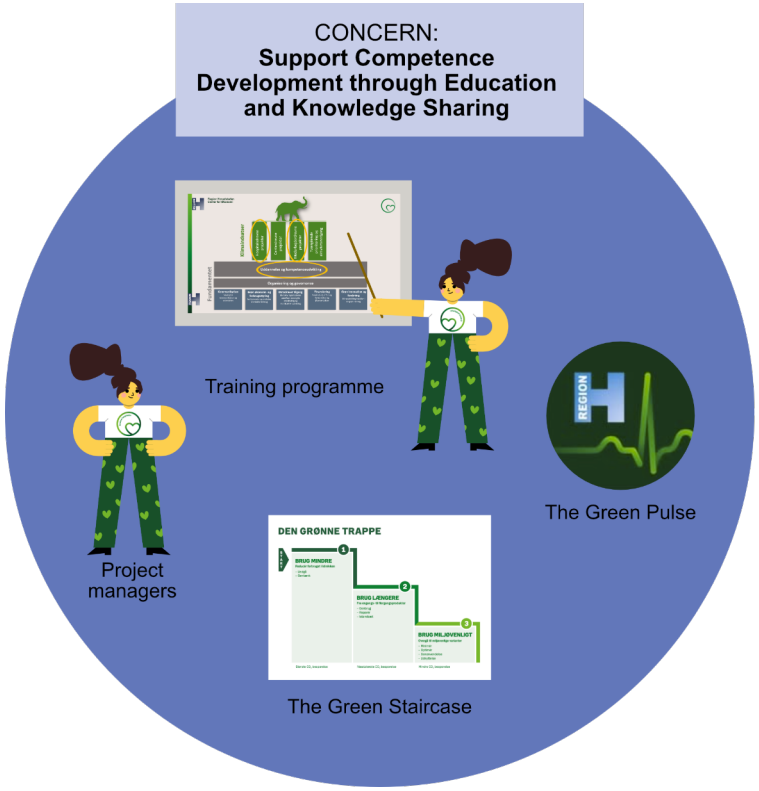


Figure 13: Actor-world sharing concern 2 in the second arena

These formal efforts are complemented by informal media, such as the Instagram account The Green Pulse (*Den Grønne Puls)*, which shares green initiatives and fosters inspiration across hospitals. These digital and interpersonal platforms work to establish sustainability as part of clinical discourse.

Another pivotal non-human actor is the Green Staircase, which prioritises CO_2 reduction initiatives into three tiers: *"use less"* (highest impact), *"use longer,"* and *"use sustainable alternatives"* (lowest impact). It is designed to guide decision-making, but remains underutilised: *"Despite having gone over the Green Staircase a hundred times, they still misunderstand it."* (Project Manager, 22.04.25, App. E). This highlights the challenge of embedding climate literacy into clinical reasoning. Without adequate integration and support, strategic tools risk becoming symbolic rather than functional.

Concern 3: Create a Solid Data-Driven Foundation for Green Decisions

Actors in this world centre their work on evidence-based practice. They prioritise producing and using climate data to support green decisions. See Figure 14.

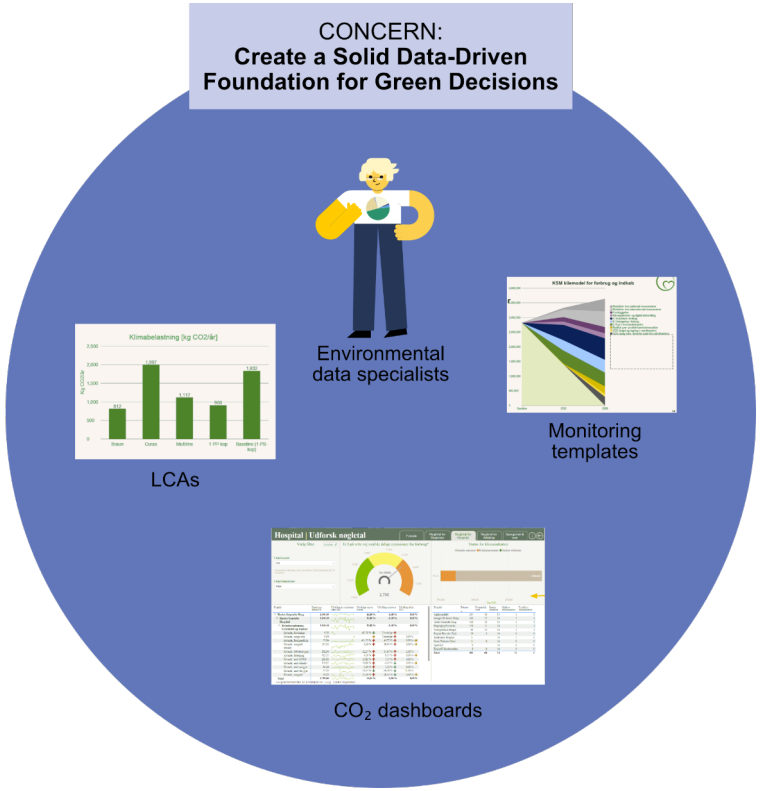


Figure 14: Actor-world sharing concern 3 in the second arena

Non-human mediators include LCAs (Life Cycle Assessments), CO_2 dashboards, and templates for tracking and reporting progress.

Environmental data specialists play a central role by helping hospitals assess which interventions offer the greatest carbon savings. Yet generating and applying this data is resource intensive. Clinical routines rarely accommodate it. As one nurse noted: *"We've talked a lot about data, but are there other ways to measure progress? It matters to staff - I can feel that they lose momentum quite quickly, and honestly, so do I"* (Head Nurse, pers.comm., 19.11.25, App. C). While the desire for data is high, its accessibility and relevance at the point of care remain limited.

Concern 4: Integrate Green Initiatives into Healthcare Practices

This actor-world engages most directly with Arena 1. It aims to embed climate efforts within clinical routines - without compromising patient safety or professional standards. See Figure 15.

Bottom-up efforts are widespread, but their impact is constrained by workload and staffing pressures: *"But this kind of work* [green transition] *is incredibly time-consuming on top of everything else. That's why it sometimes gets deprioritised"* (Head Nurse, pers.comm., 19.11.25, App. C).

Yet opportunities for synergy are emerging. A senior consultant described how redesigning surgical plans for sustainability reduced both waste and workload; *"We realised we were opening a lot of surgical equipment that wasn't being used. By standardising surgical plans, we reduced waste (...) and saved the scrub nurse from spending unnecessary time fetching equipment"* (Den Grønne Puls, 2025).

However, systemic changes - like altering treatment standards - raise professional concerns; *"These are standardised treatments based on the highest level of care, and you could say that's exactly what we're gradually starting to challenge - some might even say we're delivering a lower* [quality]*"* (Head Nurse, pers.comm., 19.11.25, App. C).

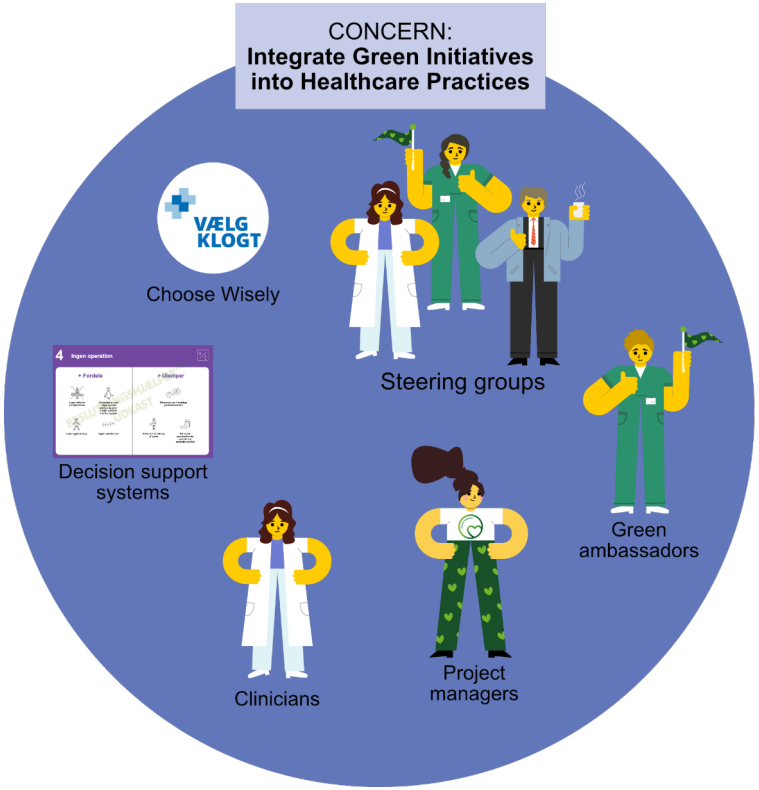


Figure 15: Actor-world sharing concern 4 in the second arena

To address this, targeted and evidence-based recommendations from Choose Wisely highlight areas in the Danish healthcare system where unnecessary tests, treatments, or procedures may harm more than help. These recommendations suggest what to avoid and offer concrete pathways for change. In parallel, decision-support tools co-developed with clinical boards have gained traction. As one project manager noted: *"It's to help patients make the right decisions, but also, in light of resource shortages (...) it's a benefit for the environment"* (Project Manager, pers.comm., 19.11.2025, App. C).

Still, the focus in climate efforts has largely been at the product level - both among green ambassadors and steering groups. There is a general desire to see projects elevated to a broader, more systemic level: *"We've spent time on the minor details, and now I'm really eager to gain a broader birds-eye perspective."* (Head Nurse, pers. comm., 28.03.25, app. D).

Viewed together, these four concerns represent distinct but interrelated actor-worlds that stabilise Arena 2. While held together by a shared ambition, their effectiveness remains shaped by structural tensions within Arena 1 - highlighting that green transition is not a linear project, but a distributed and negotiated process.

4.2 Staging a Development Arena for Negotiation and Alignment

Taken together, the four concerns stabilising Arena 2 form distinct but interdependent actor-worlds. While united by a shared ambition, their effectiveness remains shaped and often constrained by the structural realities of Arena 1. This underscores that the green transition is not a linear task, but a distributed, negotiated process marked by competing concerns and limited overlaps between arenas.

To address this persistent gap between ambition and implementation, a development arena has been configured in close collaboration with the project managers. Its aim is to strategically foster displacement between Arena 1 and Arena 2 - mobilising human and non-human actors already embedded in clinical routines - to push toward more integrated, aligned green practices. In doing so, it seeks to expand the overlap between the two arenas by enabling negotiation across professional, operational, and environmental logics.

At the centre of this effort is the strategic use of the game-based tool The Path to the Climate Jewels; a co-designed format developed to support cross-professional collaboration, translate green ambitions into concrete actions, and coordinate climate initiatives across both hospital-led and employee-led efforts.

While the game provides a shared framework, its use depends on how it is staged and activated in practice. It invites participants into temporary negotiation spaces within the development arena, which are co-staged in collaboration with the project managers and tailored to local actors and their organisational contexts. These spaces become platforms for surfacing tensions, aligning concerns, and reconfiguring clinical and environmental priorities through structured interaction and design-led dialogue.

Crucially, the development arena is not externally imposed. It emerges through deliberate engagement with the existing overlaps between Arena 1 and Arena 2, drawing in clinicians, coordinators, project managers, guidelines, digital systems, and planning tools already at play (see Figure 16 on the next page). In this way, it enables a situated choreography of translation, mobilisation, and alignment - transforming abstract sustainability ambitions into coordinated clinical action.

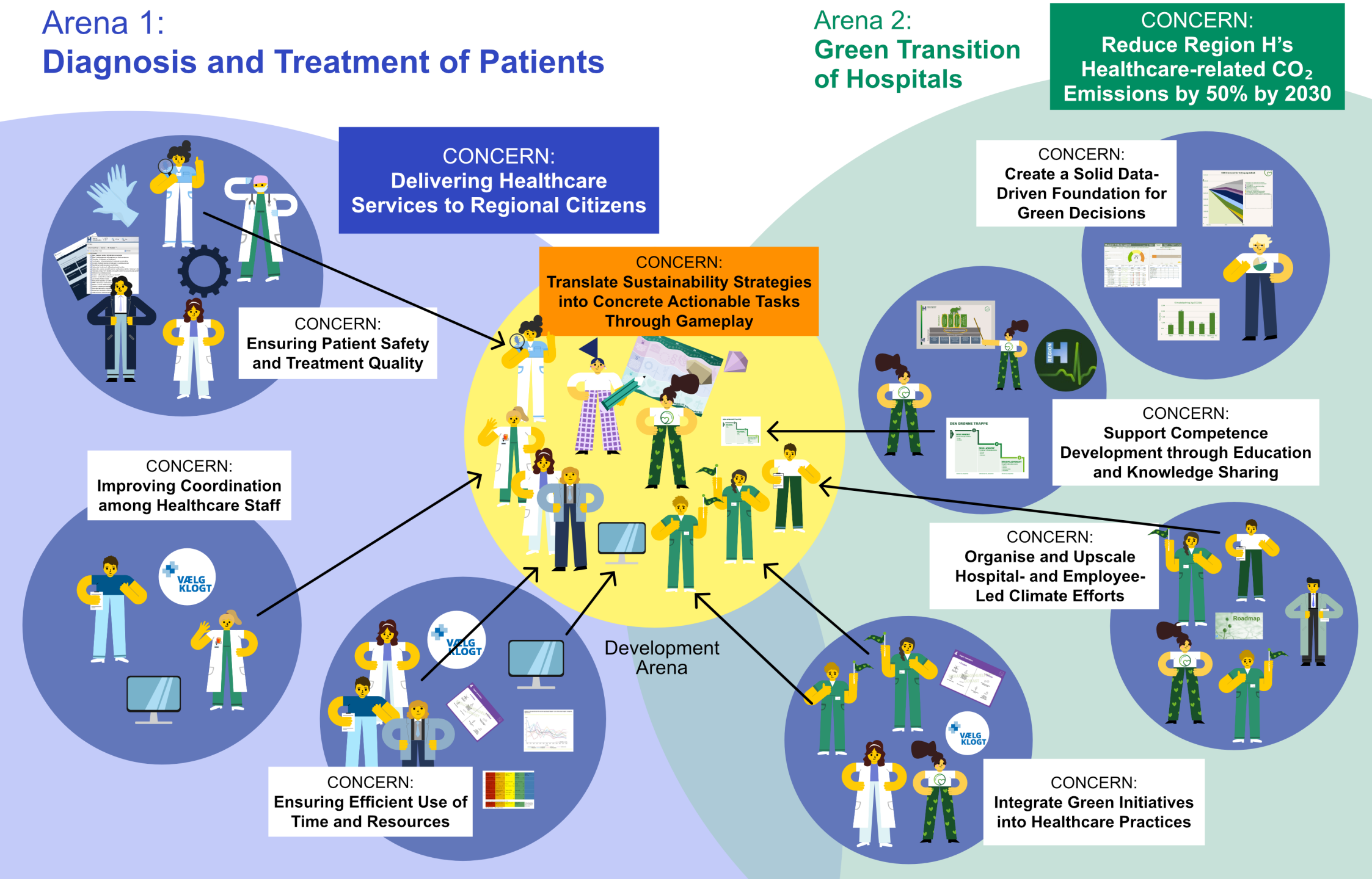


Figure 16: The emerging development arena drawing in human and non-human actors from arena 1 and arena 2

4.3 Structuring Negotiation: The Game Logic Behind The Path to the Climate Jewels

Before analysing how the negotiation spaces are staged, it is essential to first understand the rules and gameplay of The Path to the Climate Jewels (see Figure 17 on the next page). Furthermore, it is important to understand how the game is inscribed to support negotiation, mutual learning, and alignment across clinical and environmental concerns. This section introduces the game's structure, rules, and materials, and shows how it scaffolds collaboration through four interrelated modes: co-exploration, co-analysis, co-design, and co-creation.

Structured Negotiation Through Design and Material Anchoring

The Path to the Climate Jewels can be understood as a negotiation game (Pedersen & Dorland, 2025), structured around the four process phases of the Double Diamond: Discover, Define, Develop, and Deliver (Design Council, n.d.). Each phase is enacted through a corresponding collaborative mode - co-exploration, co-analysis, co-design, and co-creation - and supported by tangible game elements that guide players from open dialogue to shared decision-making and concrete planning.

While negotiation games typically emphasise co-exploration, co-analysis, and co-design, this game deliberately includes co-creation as a fourth mode. This final phase enables participants to translate insights into concrete action, by defining tasks, assigning responsibility, and establishing timelines. It ensures the process does not end in alignment alone, but results in operational commitments.

Negotiation is supported not only by interaction but by a suite of externalising tools - such as brainstorming templates, prioritisation matrices, barrier and opportunity cards, and stakeholder cards - that act as intermediary objects. These artefacts materialise participants' perspectives, help navigate tensions and make alignment visible. This design enables what Pedersen & Dorland (2025) highlight as a significant contribution of negotiation games: their ability to facilitate mutual learning through participatory structures.

Inspired by structured design methods like the Double Diamond (Marin-Garcia et al., 2020), the game uses alternating divergent and convergent modes to scaffold the negotiation process: expanding ideas, filtering options, unpacking complexity, and defining action. Each phase uses specific materials that stabilise attention and legitimate outcomes.

Table 3 on page 45 presents how the game process aligns with these four phases, mapping the dominant and embedded modes, the type of negotiation dynamic in play, the supporting tools, and how each phase functions within the overall process.

By pairing structured steps with material scaffolds, The Path to the Climate Jewels establishes negotiation as a tangible and sequenced process - moving from initial divergence to shared decisions and actionable commitments. This framework supports mutual learning, distributed insight, and situated planning. Yet its impact lies not in the format alone, but in how it is staged, interpreted, and enacted within specific organisational settings. The next section turns to two workshop cases to explore how the game has been used to shape concrete negotiation spaces, and how three key staging moves has made that possible.

→ **START**

Participants introduce themselves and read aloud the welcome message.

Introduction

Introduction cards for the three layers *Policy, Technology,* and *Behaviour* are read aloud.

Step 1
Brainstorming Potential Climate Jewels

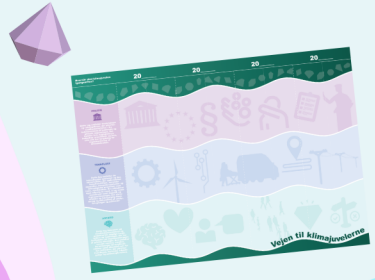
In smaller groups (3–5 people), participants brainstorm up to five possible climate initiatives, and write them onto the brainstorming sheet.

Step 2
Weighing, Discussing, and Selecting one Jewel

Each idea is assessed based on: 1) Its level on the Green Staircase, 2) Complexity, and 3) Motivation to act. One climate jewel is selected to take further. The group takes a climate jewel token and notes the selected idea.

Step 3
Exploring the Jewel Through Systemic Layers

Back in plenary, participants place the jewel on the timeline on the game board and explore how the idea is influenced in each layer by: 1) Writing barriers and opportunities on coloured cards, 2) Select relevant stakeholder cards and add real names, and 3) Place cards on the board under the corresponding layer. This step builds a systemic view of the factors that enable or hinder implementation.



Step 4
Creating Concrete Mini-Jewels

Participants break the selected climate jewel into small, actionable tasks—*mini-jewels*. For each, they define: 1) A responsible stakeholder and other stakeholders to be involved (with concrete names), 2) A clear action, and 3) A time and place for implementation. Each mini-jewel is recorded in the action plan sheet, forming a concrete and realistic starting point for implementation.

Conclusion
Documenting the Game

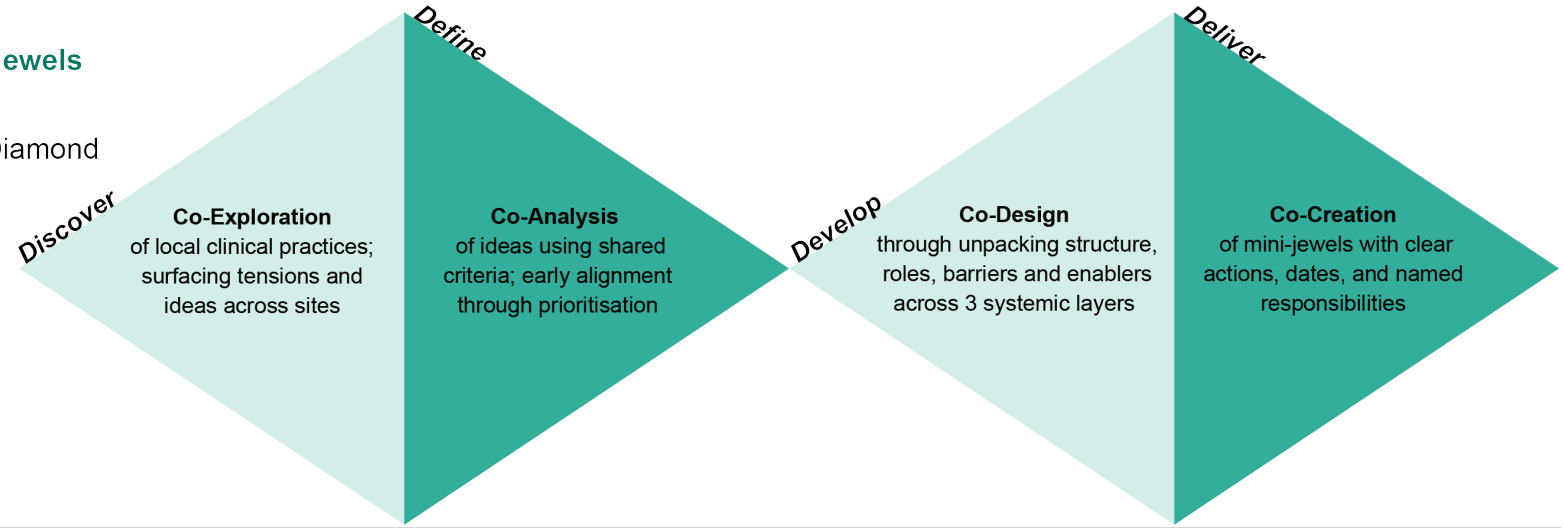
To ensure shared ownership and follow-up: Participants take photos of the board, cards, and all filled sheets. One person is assigned to distribute documentation afterwards. The group decides how the action plan should be shared or displayed The game concludes when documentation is complete, and an actionable plan is in place.

Figure 17: Rules and gameplay

The Path to the Climate Jewels

a Negotiation Game

- structured by the Double Diamond



	Discover	Define	Develop	Deliver
Dominant Mode	Co-exploration	Co-analysis	Co-design	Co-creation
Embedded Modes	Some co-analysis (surfacing variation) Early co-design (speculative ideas)	Continued exploration of values and feasibility Tentative idea framing	Embedded co-analysis (barriers, stakeholders) Reframing and implementation structuring	Continued co-design (task sequencing) Embedded feasibility and role clarification
Negotiation Game Type	Configuration game	Prioritisation game	Process-oriented game	Process-oriented game (continued)
Game Elements Referenced	Brainstorming template, jewel tokens representing ideas/initiatives	Prioritisation matrix (incl. Green Staircase, shared scoring)	Gameboard with annotated timeline, jewel token, barrier/possibility cards, stakeholder cards	Action plan template with stakeholder assignment
Function in the Game Process	Facilitates open-ended exploration across roles and sites. Templates anchor dialogue and support emergence of initial ideas (climate jewels)	Enables convergence through transparent evaluation of ideas. Tools support legitimacy of decisions and value-based negotiation	Unpacks selected climate jewel through systemic mapping. Tools surface enablers and constraints across institutional/systemic levels	Translates alignment into actionable commitment. Defines initial tasks (mini-jewels) with clear responsibilities, timing, and ownership

Table 3: Negotiation game

4.4 Staging Negotiation in Practice

This section explores how negotiation unfolds in the actual playing of The Path to the Climate Jewels, as it is staged in two contrasting workshop settings - one focuses on hospital-led efforts, the other on employee-led efforts. While the game provided a shared format, each workshop evolved through distinct constellations of context, participants, and purpose.

Each case is analysed in two parts: first, how the negotiation space emerges - how concerns are surfaced, negotiated, and aligned; second, how these dynamics has been shaped by three interrelated staging moves:

(a) interpreting and (re)framing,
(b) inviting and facilitating.
(c) inscribing games.

Each workshop analysis concludes with a summary of key findings that highlight how negotiation was enabled - and how these insights informed the development of the staging moves in a broader context.

Workshop 1: The Hospital-Led Climate Effort

This analysis focuses on negotiations within a cross-hospital, cross-departmental game session of The Path to the Climate Jewels - a workshop that brought together staff from two maternity departments involved in Climate Effort #12 on reducing consumption in patient pathways related to childbirth, gynaecology, and obstetrics. One maternity department acted as the lead hospital (L.H.), the other as the partner hospital (P.H.). Table 4 provides an overview of participants.

Unless otherwise noted, all quotations in this section are drawn from personal communication during the workshop held on 28.03.2025: (pers. comm., 28.03.25; App. D)**.**

Table 4: Participant Overview

Role	Affiliation	Short Reference in Quotations
Consultant Obstetrician	Lead Hospital	*Consultant, L.H.*
Chief Midwife	Lead Hospital	*C. Midwife, L.H.*
Deputy Head Midwife (Antenatal Clinic)	Lead Hospital	*D.H. Midwife 1, L.H.*
Deputy Head Midwife (Labour Ward Reception)	Lead Hospital	*D.H. Midwife 2, L.H.*
Midwife	Lead Hospital	*Midwife, L.H.*
Green Coordinator	Lead Hospital	*Green Coordinator, L.H.*
Chief Consultant Obstetrician	Partner Hospital	*C. Consultant, P.H.*
Deputy Head Midwife	Partner Hospital	*D.H. Midwife, P.H.*
Midwife	Partner Hospital	*Midwife, P.H.*
Infection Control Nurse (observant)	Partner Hospital	*I.C. Nurse, P.H.*
Lead Facilitator	The Section, Project Manager	*Facilitator*
Assistant Facilitator	Design Team	*Ass. Facilitator*

Opening the Space: Aligning Around What Matters Most

It is a bright afternoon at the Lead Hospital's site. Staff from two maternity departments - Lead Hospital and the Partner Hospital - gather around a long table, seated opposite each other, quite literally framing the cross-site nature of the negotiation ahead. Coffee is poured, materials are laid out, and the atmosphere is focused yet informal.

The lead facilitator opens with a simple prompt:

"What are you most focused on in the climate effort right now?"

What follows is not small talk, but the start of a negotiation. All participants from both hospitals reflect and articulate their current climate priorities - quickly revealing a shared concern: the need to move from product-level fixes to systemic change.

"We've spent 2024 working at product level. Now we're shifting to process (…) Can this game help us work more purposefully with our workflows - or can it not?"
– D.H. Midwife 1, L.H.

"The region wants us to reduce outpatient activity by 30% - and that connects to the green agenda. I'd like us to look at patient pathways through that lens."
– C. Consultant, P.H.

The tone is set. This is a space for structured reflection, critical alignment, and joint planning.

Figure 18: Opening scene showing participants introducing themselves and expressing their concerns about the green transition

Phase 1: Diverging Through Dialogue - Ideation and Exchange

The phase begins with participants gathering around a shared task: to explore potential green initiatives within the predefined focus of managing pregnant women with a history of pre-eclampsia (see Fact box on the next page) - a condition marked by clinical nuance, precautionary practices, and multiple system touchpoints.
From the outset, the space is charged with collaborative, brainstorming energy. Ideas flow freely across the table in a lively and engaged exchange. The atmosphere is one of collective curiosity and professional generosity, with participants actively listening, building on each other's ideas, and reflecting across sites.

Several key themes begin to emerge organically. One of the first climate jewels is sparked by the question: is it truly necessary to

Fact Box': Severe Pre-eclampsia

What is it? A condition involving high blood pressure and potential organ damage, threatening both mother and baby.

Monitoring includes:

- Regular scans
- Blood pressure checks
- Blood and urine tests

Why explore? Severe pre-eclampsia is resource-intensive, requiring frequent tests and visits. It is an important pathway to explore in balancing patient safety with resource and climate responsibility, addressing both healthcare needs and environmental impact.

conduct routine 24-week scans for all women with previous pre-eclampsia - or could this be limited to those with high-risk profiles? This more selective approach is already standard at L.H., prompting the insight that P.H. could adjust its workflow to adopt a similarly targeted model.

Another key discussion point is the potential to reduce face-to-face visits by transitioning to virtual consultations. Here, P.H. leads by example, sharing that they have already invested in better video technology and are regularly conducting remote appointments. This highlights how cross-site dialogue enables shared discovery. Experience-based knowledge ceases to be site-specific and becomes a collective tool for identifying opportunities for change.

Emerging Focus on Blood Test Panels

Midway through the phase, attention shifts to something seemingly routine - the two blood test panels used for this patient group - now being viewed through a more critical lens. Participants observe that

Figure 19: In the first phase of the negotiation space, participants from both sites actively discuss differences in their approaches to the prepared patient case, surfacing a range of concerns

Figure 20: Consultants from each hospital site discuss differing approaches to the patient case, highlighting variations that could inspire ideas for change.

the large panel has gradually expanded over time, often without a clear clinical rationale. D.H. Midwife 1, L.H. proposes: *"It could be worth reviewing both panels and asking: if we had to harmonise them, what would that look like? What's the minimum we should include in the large panel?"* But the concern is not only about what is being tested - it is also about when such comprehensive panels are genuinely necessary. As D.H. Midwife 2, L.H. adds: *"And perhaps a clinical discussion as well - about when the large panel should actually be used."*

These reflections reveal a wider behavioural pattern - how standardised tools like test packages can slowly become bloated, and how routine practices may drift from their original intent. The discussion around blood test panels surfaces both clinical and environmental opportunities, positioning it as a strong candidate for further development in the later stages of the game.

Facilitation in a Divergent Phase - Guiding Without Containing

In this early, open-ended phase, discussion is broad, exploratory, and occasionally unruly. The facilitator's role is to keep the space open while subtly guiding the conversation towards meaningful outcomes. Both facilitators play a crucial role in helping participants stay on pace and begin distilling concrete initiatives.

Though the group runs over time, the facilitators allow it, recognising the value of the rich exchange. By the end of the phase, the team has identified several promising climate initiatives and is beginning to feel a growing sense of shared ownership and purpose.

The climate jewels include (See figure 21)**:**

- Reducing routine 24-week scans
- Converting 12-week appointments to virtual consultations
- Rationalising blood testing

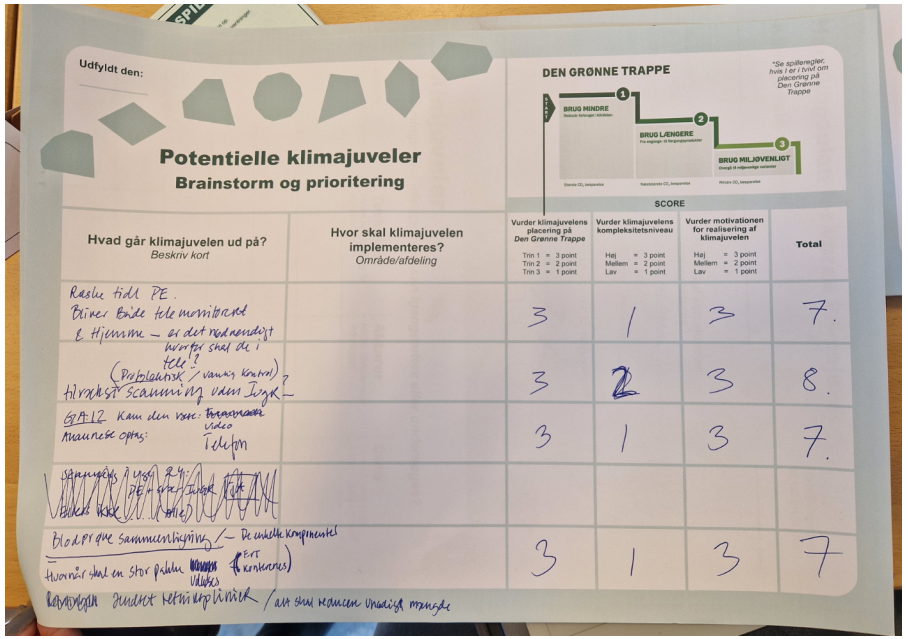


Figure 21: The brainstorming template captures ideas from the first phase (left side), while the second phase uses the matrix (right side) to weigh three criteria, supporting the decision and definition of the chosen jewel

Phase 2: Co-Evaluating the Climate Jewels - Strategic Focus Through Negotiation

In this phase, the negotiation now shifts focus: participants begin co-evaluating their climate jewels and deciding collectively which one to prioritise. When assessing the environmental value of each idea, a question from Midwife, P.H. exemplifies the kind of practical thinking the Green Staircase tool is designed to inspire: *"Would a shift from in-person to video consultations still count as a full avoidance?"* she asks.

The facilitator confirms and clarifies what is being avoided with this initiative: *"Transport, and products like gloves, examination paper, etc."*

In this moment, the Green Staircase becomes more than a scoring tool. It helps translate the broader Green2030 sustainability goals into something tangible - showing how a seemingly small clinical decision, like opting for a virtual consultation, can carry significant environmental weight. It also reinforces the facilitator's role as a bridge between abstract sustainability ambitions and the practical realities of clinical routines.

When participants assess the level of complexity for each jewel, it helps reveal whether the initiative is within the team's direct control, or whether it depends on wider coordination across systems, departments, or hierarchies. Some ideas are relatively straight-forward. As D.H. Midwife 2, L.H. notes: *"I managed to change things within 24 hours (…) Everyone immediately agreed, and we adjusted straight away."*
Others present greater complexity - not because the actions themselves are difficult, but because they require cross-professional collaboration or structural change. Throughout, the facilitator helps the group unpack these layers, identifying where they have autonomy and where broader coordination is essential.

Figure 22: In Phase 2, the ideas generated in Phase 1 are analysed as participants score each jewel (idea) against three criteria and negotiate which should progress to Phase 3.

As the discussion turns to motivation, the negotiation widens to consider networks, alliances, and support structures. The facilitator prompts: *"What about the motivation to work on this? For you, but also for your wider team - do you think there would be support for this initiative?"* This reminds participants that sustainability efforts are more likely to succeed when they are collectively supported - not only when they are technically feasible.
Importantly, the facilitator also reinforces that the goal is not to crown a "winner" based solely on scores. The real aim is strategic focus. Still, as the conversation edges towards decision-making, hesitation arises. The group is deeply engaged and reluctant to narrow their ambition. *"We might end up doing all four initiatives,"* says D.H. Midwife, L.H. Here, the facilitator gently insists: *"We need to pick one to work on for the next phase of the exercise. We have to prioritise so we can make real progress on at least one."*

The group agrees on the 24-week scan initiative - what they affectionately call their "crown jewel." But as they begin transitioning into the next phase, a critical issue arises. Consultant, L.H. reminds the midwifes from L.H that they do not actually perform the particular scan - and suddenly - it becomes clear: the chosen jewel is only relevant to P.H. It lacks traction across both sites - prompting the group to reconsider and renegotiate. Here, D.H. Midwife 1, L.H. reframes the discussion: *"(…) with the blood test case, we all had something to take home and work on."*

Recognising the shared relevance, the facilitator supports this reframing - even though the group has technically moved into the next phase. A new consensus forms quickly, and the blood test panel becomes the revised crown jewel. It resonates across both sites because it connects to daily practice, has clear environmental potential, and invites deeper reflection on clinical routines and professional culture. As C. Midwife, L.H. notes: *"This is actually a good exercise, because we take blood tests in a lot of situations. And (…) why are some components even included in the first place? It just snowballs from there."*

This reframing sparks a new negotiation: what is the scope of the initiative? Should it focus on what is tested, when tests are ordered - or both? The facilitator adds an important environmental consideration: *"Removing a few individual blood tests only reduces climate impact if you remove an entire sample tube. It doesn't really count otherwise."* This is met with a clinical counterpoint from C. Consultant, P.H.: *"But there's also the time factor (…) You have to sit and look at more results."* This tension reflects a broader question: clinical efficiency or environmental benefit? Rather than choosing between them, the group seeks alignment - agreeing the initiative should address both dimensions: reducing unnecessary elements in the panel and clarifying when it should be used.

A Culture Comes into View - "Just in Case" Testing

What began as a conversation about adjusting blood panels now evolves into a deeper reflection on clinical culture and professional behaviour. Midwife, P.H. names the issue: *"Sometimes* [tests] *are done more as a precaution, even when there's nothing obviously serious."* She frames it not as a technical issue, but a behavioural one. Others quickly agree, and different types of guidance are proposed. D.H. Midwife L.H adds a generational lens: *"It's often the younger generation of doctors - it's their uncertainty that leads to this 'just in case' testing."*

C. Consultant, P.H. highlights the challenge of formalising such decisions: *"It's just hard to create guidelines for every if, and, or but (…) Sometimes it comes down to clinical intuition."* Consultant, L.H. agrees *"You can't put it into strict boxes."*

It becomes clear that this is not just about making better rules - it is about how professional judgement is cultivated and shared. D.H. Midwife 2, L.H. reframes the issue as one of mentorship: *"But how do you pass on your experience and calm judgement? Is there a way to help that confidence rub off on others?"*

Figure 23: The VIP guidelines brought by participants from each site serve as anchors in the negotiations, supporting the representation and mediation of insights into processes and differences

This marks a shift: from individual decision-making to collective reflection. The group explores informal peer-checking practices - not as rigid rules, but as supportive routines that could empower junior staff and reduce unnecessary testing.

A deeper layer of the crown jewel is now visible: this is not just about technical adjustments to a test panel. It is about fostering a culture of shared judgement, psychological safety, and professional dialogue. The jewel becomes a shared concern - owned by all, relevant across contexts, and rich enough to guide the next phase.

Phase 3: Reframing the Crown Jewel - Seeing Through Systemic Lenses

This section uncovers how mutual learning accelerates in phase 3 when the group renegotiate and reframe the blood panel jewel by examining it through a broader systemic lens.

Figure 24: Before exploring the chosen jewel across the three layers of the game board, the timeline is annotated to make the agreed timeframe visible to all participants. The jewel token is then placed on the timeline to indicate when it should realistically be implemented

Figure 25: In Phase 3, the chosen jewel related to blood panels is unpacked across three layers, revealing both constraints and enablers. This deepens the negotiation and sharpens the focus on which stakeholders are important to engage at each layer.

Political Layer - From Barriers to Agency

When prompted to consider formal or structural barriers to implementing changes to the blood test panel, C. Consultant, P.H. immediately dismisses the concern: *"No, no - not at all."* However, as the conversation progresses, a shift occurs - from identifying obstacles to uncovering latent opportunities. The group realises that the national framework poses no real constraints, and that local clinical guidelines (VIPs) are within their control. *"You can go in and edit your own VIP guidelines - no one else needs to give permission,"* confirms the facilitator.

This realisation unlocks a sense of agency - but also surfaces a key concern linked to Green2030: regional scalability. The facilitator follows up: *"Do you have a local VIP? Or some at the regional level? (…) The goal is to scale this to other hospitals within the same specialty - at minimum."*

C. Consultant, P.H. responds with openness: *"The regional ones are more general (…) but we could easily develop something. We have senior consultant meetings and lots of email correspondence."* C. Midwife, L.H. adds: *"And we can reach out within our own networks - across all maternity units."*

What started as a local initiative is now reframed as a scalable initiative. The political layer, once seen as distant or bureaucratic, becomes a practical lever for green clinical innovation.

Technology Layer - System Constraints and Digital Pathways

A key insight emerges from a simple question posed by D.H. Midwife, P.H.: *"When you order a large PE panel, do you have to tick off all the tests manually?"* Midwife, L.H. replies: *"No, we order it as a package, and they all come through automatically."*

Figure 26: In Phase 3, stakeholder cards are completed with specific names of relevant stakeholders to engage at each layer

This brief exchange uncovers a critical system constraint: clinicians cannot simply choose not to order certain tests - the IT system delivers all by default. *"Then the package itself needs to be changed,"* the facilitator concludes. D.H. Midwife, P.H. highlights the implication: *"Yes - so you'll need someone too. You can't make that change yourselves."*

What first appeared to be a minor clinical decision now reveals a dependency on IT access, digital workflows, and permission structures. The climate jewel is no longer just about behaviour or mindset - it is embedded in the practical realities of digital systems.

Once again, the facilitator and the cross-sited mirroring help the group surface hidden dependencies and identify the roles needed for implementation.

Behaviour Layer - Intuition, Responsibility, and Efficiency

The conversation moves into the behavioural layer, where professional responsibility, intuition, and uncertainty are most deeply felt.

A moment of clinical honesty comes from C. Consultant, P.H.: *"Sometimes the only clue is in the blood - before anything else shows up. We all really respect that. It's not that we're being difficult by ordering tests."* She adds:*"We've all had a patient we've sent home who turned out to be seriously ill."* This remark captures the emotional burden clinicians carry and reframes "just in case" testing as an expression of clinical care. Still, she reflects on the value of experience: *"There's no doubt that those of us who've been doing this a long time - we take far fewer blood tests, discharge patients faster (…) But that's part of their [the junior doctors] learning process."*

C. Midwife, L.H. agrees: *"I think maybe [C. Consultant, P.H.] already touched on it - that in this case, you can't create a rigid rule."* C.

Consultant, P.H. replies: *"No, it's difficult. So difficult, I'd say it's almost dangerous to make one."* C. Midwife, L.H. brings the stakes into sharp focus: *"This is the condition that women and babies die from in other countries - pre-eclampsia."*

Here, the negotiation shifts to exploration: how can teams better support junior clinicians in developing confident, reflective judgement? The assistant facilitator prompts: *"So how can we create more confidence?"* C. Midwife, L.H. responds: *"It's about formalising what can be systematised - but also encouraging staff to ask a more experienced colleague if they're in doubt."* Midwife, P.H. builds on this: *"Especially for our kind, sweet junior doctors (…) If we had a workflow where you always consulted with a colleague."*

This suggestion gains traction, not as a rule, but as a cultural norm of peer consultation. C. Consultant, P.H. stresses: *"If you're in that 'just in case' mindset, then you should have to consult with a midwife or another doctor."* D.H. Midwife, P.H. adds: *"Sometimes, you can already tell just by the way you say it aloud."* C. Consultant, P.H. confirms: *"Yes - when you hear yourself say it out loud."*

This becomes a powerful insight: that voicing uncertainty in a trusted environment can itself be a form of clinical reflection and risk management.

Efficiency and Workflow Pressures

The discussion also exposes another major behavioural driver: efficiency. The group reflects on how workflow pressures shape testing behaviour.

Midwife, L.H. admits: *"We're not officially allowed to prescribe (…) But it doesn't work that way in practice."* The group nods in understanding - not to condone, but to acknowledge the realities of workflow. D.H. Midwife 1, L.H. adds: *"That would be such an annoying bottleneck."* D.H. Midwife 2, L.H. reframes it: *"It's about autonomy - but also about not creating a backlog."*

Here, a second behavioural pattern emerges: anticipatory efficiency. Tests are sometimes ordered in advance, not out of need, but in case they are needed later. D.H. Midwife 1, L.H. reflects: *"We might say, 'Let's send her by the lab first,' even though we know her pressure might be fine once she's settled. But by that point, we've already taken the blood sample."* C. Midwife L.H. closes the loop with a clear directive: *"That's what we need to stop doing."*

What becomes clear is that over-testing is not only driven by uncertainty - it is also embedded in informal routines aimed at speed. Naming these patterns allows the group to reflect more consciously - and reimagine what efficient, sustainable care could look like.

Figure 27: As the group works across the three layers, the climate jewel reveals deeper needs - IT adjustments, policy alignment, and behavioural shifts - highlighting that lasting change depends on both systems and culture

A Strategic Jewel, Situated in Practice

Examining the blood panel jewel through the systemic lenses reveals its true complexity. The negotiation gains depth and momentum - accelerating mutual learning and collective insight.

What began as a local clinical tweak becomes a scalable policy opportunity. The group realises changes can be made independently and embedded in local guidelines. A simple adjustment turns out to require IT system changes, highlighting the need to align clinical aims with digital infrastructure. Deeper still, the discussion uncovers behavioural drivers - caution, time pressure, and junior uncertainty - showing that sustainable change depends on culture as much as systems: one of confidence, collaboration, and reflection.

The crown jewel now carries organisational weight, infrastructural clarity, and cultural resonance. What began as a surface-level adjustment is transformed - through co-design - into a focused, context-aware, and strategically grounded initiative.

Phase 4: Operationalising Change - Co-Creating the First Steps

The final phase of the negotiation shifts decisively toward action. The focus is no longer on what could be done, but on what will be done - by whom, and when.

Translating Insight into Action

As the session shifts from reflection to action, the facilitator guides the group in detailing next steps, roles, and timelines across sites.

A key task is revising the VIP guidelines, with P.H. stepping up. C. Consultant, P.H. and D.H. Midwife, P.H. take the lead - addressing a structural gap identified by colleagues. *"We often lack (...) like, a doctor (...) to move on the VIP updates,"* notes C. Midwife, L.H. *"That's our Achilles' heel - the administrative follow-up,"* adds D.H. Midwife 1, L.H.

As C. Consultant, P.H. explains: *"If things need to happen quickly, it's me and [D.H. Midwife, P.H.] - we have admin time."* Their leadership brings momentum and credibility. *"Everyone has huge respect for [C. Consultant, P.H]"* affirms D.H. Midwife 2, L.H.

Figure 28: In Phase 4, the documented barriers and opportunities from the cards are translated into concrete tasks. Participants are supported in defining small mini-jewels: practical starting tasks that specify what needs to be done, when, and by whom, making the ideas more tangible and actionable

Strategic Timing and Cross-Site Coordination

As implementation planning begins, the team shifts to strategic sequencing - especially for initiatives involving behavioural change.

"After Easter could work really well (…) we have a big staff meeting on 6 May we could prepare for," suggests D.H. Midwife 2, L.H. Her point is clear: lasting behavioural change needs time, communication, and alignment - not just workflow updates.

With energy dipping and coordination across sites increasing cognitive load, clarity becomes essential: *"[D.H. Midwife 2, L.H] is noted for our site - who's responsible on your end?"* asks D.H. Midwife 1, L.H. *"It's me and [name of a colleague] (…) and maybe a communications consultant to help create a poster,"* responds Midwife, P.H, who has a coordinating function in her department. The facilitator anchors the conversation: *"Do you have a date in mind to start?"* The group agrees: after Easter is realistic.

Despite fatigue, mutual support and facilitation keep the plan moving - roles are clarified, timelines set, and intentions turned into action.

Creating a Baseline

Before implementation begins, the group identifies one final essential task: *"Are we going to create a baseline? How many blood tests are we currently taking?"* asks D.H. Midwife 1, L.H. D.H. Midwife 1, L.H. quickly offers to lead: "*Should I be the one to reach out to [name of a colleague] about it?"* D.H. Midwife, P.H. agrees: *"Yes, that would be great."*

This step reflects a shared commitment to grounding green efforts in evidence. The baseline becomes more than a data point - it enables progress tracking and supports decision-making.

Where Concerns Meet Action

By the end of the game session, the group has moved from open-ended reflection to a clear, coordinated action plan. Each element of the plan - from guideline revisions to baseline data collection - is now anchored in named responsibilities, timelines, and a rationale that bridges clinical and organisational logic.

<u>The plan embodies concerns from both arenas:</u>

From Arena 2 (Green transition): a demand for implementable, scalable, and data-driven sustainability initiatives with system-wide relevance. The plan meets this need by offering a tangible starting point - while also pointing toward regional scalability.

From Arena 1 (Healthcare delivery): strong concerns around patient safety, workflow practicality, professional autonomy, and resource efficiency. These are directly embedded in the structure and timing of the chosen mini-jewels.

In this way, the action plan acts as more than a checklist - it becomes a non-human actor: a concrete artefact that stabilises shared concerns across professions, departments, and sites. It makes the negotiation process visible and portable, functioning as a translational tool that connects clinical judgement, green policy, and system-level decision-making.

And Then There Were Three…

As the session closes, D.H. Midwife 1, L.H. brings the group back to a broader view: *"Can I just say one last thing - we also have all the other [climate jewels]."* Rather than shelving the remaining ideas, the group chooses to pursue them independently. P.H. will move forward with the week 24 scan; L.H. will begin early virtual consultations; *"Yes. For us, that's really just plug and play"* - D.H. Midwife 2, L.H.

The facilitator sums it up: *"So, in fact, you've ended up with one shared climate jewel - and two individual ones."* D.H. Midwife 1, L.H adds with a smile: *"One crown jewel - and two smaller ones"*

This moment reveals something deeper. The open space in Phase 1 - though time-consuming - proved valuable. That early divergence allowed ideas to mature in both nuance and practicality. Now, that initial breadth enables quick, confident implementation.

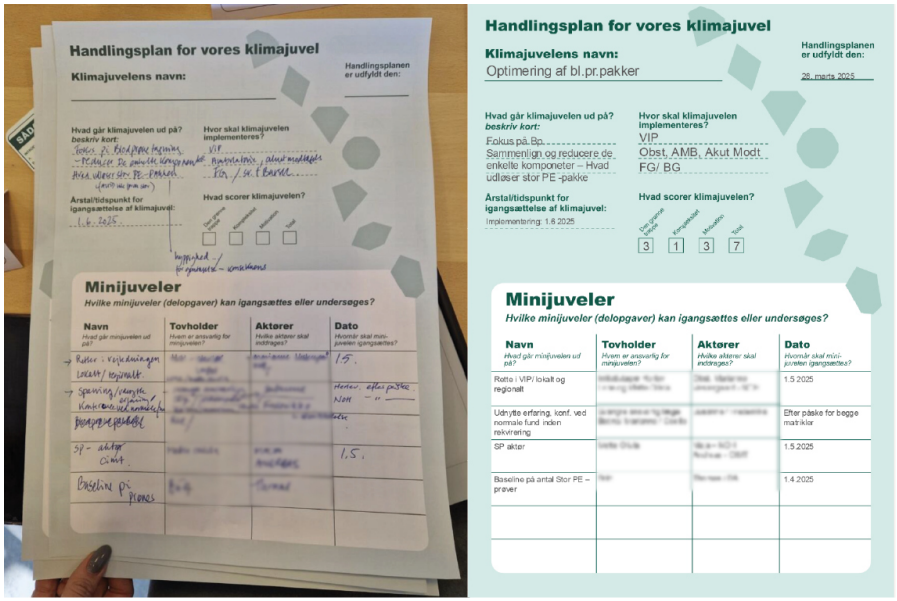


Figure 29: At the end of the session, the action plan is completed in its analogue form (left). After the workshop, a digital version (right) is created to ensure readability. Both versions of the action plan are shared with all participants via email

The Power of Situated Negotiation

At the close of the session, the assistant facilitator from the design team poses one final question:

"Has The Path to the Climate Jewels made your work on the green transition more concrete and action-oriented?"

Everyone stands up - signalling a clear and unanimous *yes*.
This response speaks more clearly than any written report: the negotiation game did not merely generate ideas - it created the conditions for shared, actionable progress.

Participants reflected on what made this possible. For D.H. Midwife 2, L.H., the cross-site format was essential: *"It is the way this game is designed - with representation from both sites - that really makes a difference. When you are just sitting in your own little pond, everything seems fine (…) But here, we challenge each other both ways."*

This ability to surface and reflect on practical differences in routines, assumptions, and priorities proved to be a central strength of the format: *"That is knowledge sharing,"* added C. Midwife L.H. - *"Consultant, L.H. says one thing, and C. Consultant, P.H. says, 'That is how we do it.' And then we ask: oh, why do you do it like that?"*

The Facilitator elaborated on this strategy for mutual learning: *"You were selected to play this game because we expected some differences - and we have seen that throughout the last year. But what is exciting is how those differences also create learning. If you can do it, maybe we can too - and vice versa."*

Figure 30: After two intense hours of gameplay, the ambitious participants not only finalised the action plan for the chosen crown jewel but also went further, developing implementation plans for two additional jewels as a bonus

The game made visible how clinical decisions, environmental concerns, and structural constraints are interlinked - and how they can be addressed through joint negotiation.

"It really made a difference that you had two professional groups involved," said Green Coordinator (L.H.). *"If it had only been midwives, or only doctors or nurses, I do not think you would have reached this point."*

"No, no - the composition was crucial," agreed D.H. Midwife 1, L.H. *"It would have been impossible without you two [doctors]."*

At the same time, participants offered thoughtful suggestions for improvement: *"The double documentation is a bit heavy (...) maybe we could just transfer it afterwards or something?"* suggested D.H. Midwife 1, L.H. Others noted that a clearer explanation of the systemic layers and a brief overview of the agenda could support participants in staying focused during play.

The potential for scale also became visible: *"Once we have made a change, it is easy to show others. I am not saying it is easy to implement, but it is easy to present. And between us, we represent nearly 40% of all births in the Capital Region,"* said Chief Midwife, L.H.

In this way, the session did far more than raise awareness. It created a shared space for reflection, negotiation, and commitment - grounded in clinical reality, supported by carefully designed tools, and strengthened by mutual professional trust.

Staging Moves - Workshop 1: Strategically Configuring a Cross-Site Negotiation Space

This workshop was deliberately staged as a negotiation game-based intervention to support system-level climate action in obstetric care. It drew on The Path to the Climate Jewels not only as a facilitation tool, but as a strategic - yet playful - platform for aligning clinical and environmental concerns across two hospitals.

(a) Interpreting and (Re)framing

The workshop was anchored in the hospital-led Climate Effort #12H and framed from the outset as a targeted attempt to move from product-level tweaks toward workflow and pathway-level restructuring. The case - post-pre-eclampsia follow-up - was strategically selected to activate tensions between resource use, precautionary culture, and clinical accountability.

This framing was communicated clearly to participants in the invitation and further reinforced by selecting a patient case with structural depth: one that required them to consider not just individual practices but how routines, guidelines, and infrastructure shape climate-relevant outcomes. The case was shared in advance to prompt early reflection.

Rather than framing the session as a general sustainability dialogue, it was positioned as a focused co-analysis of a shared patient pathway - with the aim of surfacing system-level levers for change.

(b) Inviting and Facilitating

Participants were strategically selected in advance through collaboration between the project manager from Region H's Green Section and deputy head midwives from both the lead hospital (L.H.) and the partner hospital (P.H.). The goal was to stage a negotiation space that combined formal authority with grounded clinical insight and ensured mutual learning across institutional contexts.

Figure 31: Project managers and lead facilitators who co-staged and guided the two separate negotiation game sessions during Workshop 1.

The participant composition included:

- **Senior consultants** and deputy head midwives with formal mandates and organisational responsibility
- **Frontline midwives** with detailed knowledge of daily workflows and practice-based challenges
- **An Infection Control Nurse** (in case negotiations touched on hygiene risks)
- **A Green Coordinator** (as an observer, to explore the game's potential as a future facilitation tool)

Cross-hospital inclusion was essential to enable comparative dialogue and strengthen alignment across sites.

To anchor the session in real clinical practice, participants were asked to prepare in two ways:

- By bringing their current VIP guidelines to support evidence-informed negotiation
- By reviewing a shared clinical case, developed by P.H. using a structured template co-designed with the project manager and design team (see Figure 32)

This preparatory work positioned the patient pathway as both a shared frame of reference and a locally grounded negotiation object.

Patient Pathway Template

Instructions: *Complete the template for each patient pathway so it can serve as a basis for exploration and discussion in the game.*

1. **Referral Type:**
   (Choose one: 1813 [medical helpline], GP, specialist, self-referral, other department/hospital)

2. **Reason for Referral:**
   (Briefly describe why the patient is referred, e.g. specific symptoms, concern about a particular condition, follow-up on previous treatment, etc.)

3. **Triage:**
   (Describe how the patient is triaged – admitted via emergency department, outpatient assessment, telephone consultation, etc.)

4. **Diagnosis:**
   (Suggest a possible diagnosis based on the reason for referral and the triage assessment)

5. **Diagnostics/Examination:**
   (Specify which tests should be conducted, e.g. standard panels, blood tests, urine test, X-ray, scan, ultrasound, MRI, etc.)

6. **Next Steps:**
   (Describe the next steps in the patient's treatment, e.g. discharge with advice, follow-up with GP, referral to a specialist department, surgical treatment, medical treatment, etc.)

Figure 32: A structured template, co-designed with the project manager and design team, was completed with a shared clinical case prior to the workshop.

Facilitation was led by the project manager responsible for Climate Effort #12. She was deliberately positioned as both facilitator and embedded Arena 2 actor - enabling her to bridge regional climate strategy with clinical realities and to model how sustainability goals can be translated into practice. The assistant facilitator from the design team supported pacing, structure, and navigation through each game phase.

The facilitation strategy was intentionally designed not only to guide the group through the game structure, but also to accommodate flexibility - holding space for emergent dynamics while ensuring steady progression toward shared, actionable outcomes.

The opening prompt from the facilitator in the session - *"What are you most focused on in the climate effort right now?"* - was deliberately designed to surface local concerns and activate cross-site variation from the outset.

(c) Inscribing the Game

The core structure of the game remained unchanged, but several elements were deliberately re-inscribed to support the strategic aims of the workshop:

- **System Layer Cards** were augmented with context-specific backside examples, pre-selected to reflect relevant issues in obstetric workflows (e.g., local guideline revision, IT dependencies, professional norms). These ensured that abstract concepts were grounded in recognisable scenarios, reinforcing a shared systemic lens (see Figure 33).
- **VIP guidelines**, brought by participants, became live reference points for discussion - enabling direct comparison of local routines and surfacing actionable differences.
- **The patient case** itself functioned as a high-resolution anchor - allowing participants to test ideas against a shared clinical reality and reflect on differences between sites.

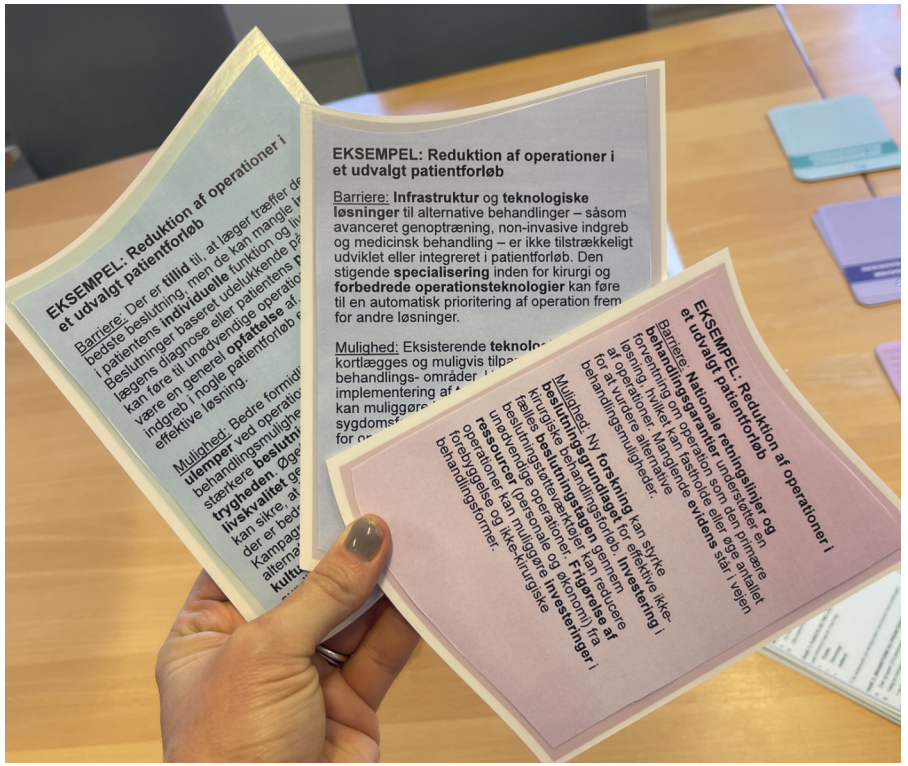


Figure 33: System Layer Cards re-inscribed with context-specific examples on the reverse. Examples were adapted from the official game rulebook, reformatted to match the card layout, printed, and affixed with tape specifically for this workshop.

Together, these design decisions transformed the generic game into a situated negotiation space, tailored to the clinical and political realities of the two hospitals involved. Rather than only sparking ideas, the session was staged to support strategic system reflection and operational alignment across sites, roles, and arenas.

Workshop 2 - Employee-Led Climate Effort

This section analyses the negotiation space as it unfolded during the Green Ambassador training programme in April 2025. The session involved 24 Green Ambassadors - primarily clinicians, but also a few logistics and support staff - from departments and hospitals across Region H. The Path to the Climate Jewels was played at six tables, each facilitated by project managers or members of the design team. The session served as an introduction to the tool through live testing the game's ability to support locally grounded, employee-led climate initiatives. Unless otherwise noted, quotes are drawn from post-session facilitator reflections (see App. E).

Figure 34: Workshop for the Green Ambassadors in training, where a shorter version of the game was introduced. The primary aim was to familiarise them with the tool as a new addition to their toolkit for local green transition

Opening the Space - Confidence, Familiarity, and Constraints

Participants entered the negotiation by brainstorming local climate initiatives. Some tables *"filled two pages with ideas - no one was holding back"* (Project Manager A), while others hesitated. Familiarity among participants appeared crucial: groups that had spent more time together engaged more easily. At one table, *"they didn't know each other, which made them less comfortable talking freely"* (Project Manager B).

Figure 35: Participants during the brainstorming session. Some needed support from the facilitator to get started, while others quickly filled out the brainstorming sheets

Confidence also shaped participation. *"When ideas go straight from their head to the game board, that can feel limiting"* (Project Manager C). This phase revealed how open formats depend not just on structure, but on social ease and readiness to engage.

From Ideas to Priorities - Guidance and Realism

Prioritisation introduced friction, especially when placing jewels on the Green Staircase. *"Despite having gone over the Green Staircase a hundred times, they still misunderstand it"* (Project Manager D). Yet several facilitators noted that this friction had pedagogical value - it served as informal training in how to evaluate climate initiatives.

Facilitation styles varied. Some facilitators nudged groups toward feasible, department-relevant jewels. At one table, where participants struggled to get started, a facilitator allowed a participant to use a case she had been working on throughout the course - even though this was not the intended approach. This exception helped the group move forward and revealed the complexity of the case through the game process, illustrating how structured gameplay can surface hidden layers even in familiar projects.

Participants often chose overly complex ideas. *"It becomes too complex when you're 'only' a Green Ambassador and not with your own team"* (Project Manager B). In contrast, simpler ideas, like reducing print usage, produced clear and motivating outcomes: *"All four could relate to it, and their mini-jewels became concrete tasks"* (Project Manager A).

Exploring System Layers - Seeing Constraints and Feeling Distance

When the chosen jewel was examined across policy, technology, and behaviour layers, it clarified systemic barriers for many. Some participants found this clarity empowering, while for others, the complexity became daunting. *"It can suddenly become very real"* (Project Manager C). The game revealed not only what needed changing, but also how distant that change might feel from one's own role.

Figure 36: The scoring is intended to support participants in their negotiation, not to produce 'correct' scores, something not all found easy to grasp. Here, the criteria from the Green Staircase Model reveal common misunderstandings, highlighting the importance of facilitator guidance in this phase

Figure 37: Participants engaged actively as the chosen jewel was explored across the layers. While most quickly grasped the structure, some needed additional guidance. The facilitator also supported in translating discussions into concrete formulations on cards mapping barriers, possibilities and stakeholders for each layer

Group composition also shaped engagement. At some tables, diversity of hospitals and roles sparked rich dialogue. At others, it created detachment: *“The jewel ended up reflecting one person’s frustration more than a shared initiative”* (Project Manager E).

Figure 38: The facilitator helps participants gain an overview of all stakeholder cards, offering inspiration for who to engage at each layer

Figure 39: Mapping the barrier-opportunity and stakeholder cards across the three systemic layers reveals the complexity of the jewel, clarifies its implementation feasibility, and identifies key systemic focus areas, making it easier to approach

From Planning to Action - Matching Scope to Role

Breaking down the jewel into mini-jewels was energising - if the idea was well-matched. *"They lit up when their mini-jewels became things like teaching a colleague or making a poster"* (Project Manager A). But overly ambitious projects risked disengagement. *"If the jewel becomes too complex, participants may leave thinking: 'I can't solve this'"* (Project Manager A).

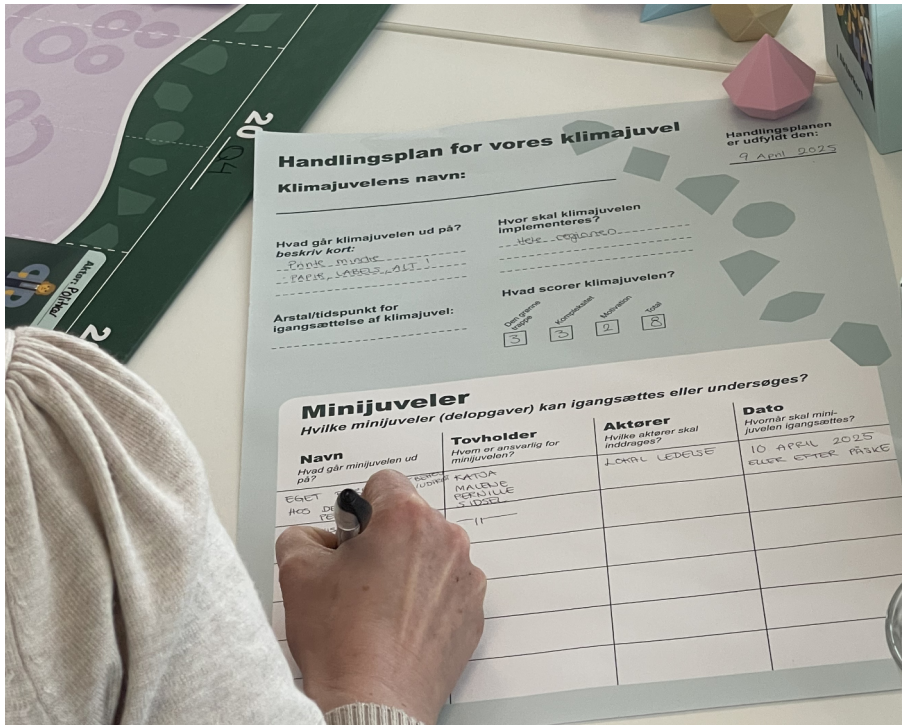


Figure 40: In the final Phase 4, the shared insights from mapping barrier-opportunity and stakeholder cards in Phase 3 are translated into small, actionable tasks in the action plan - clarifying what needs to be done, by whom, and when

Facilitators agreed that success depended on scale and relevance. Tangible, department-level ideas led to stronger engagement and clearer outcomes. When participants chose complex jewels that exceeded their local mandate, the process often stalled. As noted by one facilitator from the design team, it can feel like a barrier *"if every mini-jewel involves having to ask a manager."*

Figure 41: After the game is finalised, the game board with all mapped cards across the three layers, the action plan, and the brainstorming/ scoring sheet are laid out. Participants are encouraged to take photos to document and remember their discussions and plans.

Reflections from the Negotiation Space and Participant Feedback

The game created a space not only for decision-making, but for calibration and mutual learning. It enabled participants to test ideas against organisational constraints, refine their sense of feasibility, and exchange perspectives across roles and hospital contexts. Though the groups were more multidisciplinary than truly interprofessional, the game structure helped distribute reflection and mirror-based reasoning. As noted by one facilitator, *"they had gained a really good overview just from going through the different barriers, opportunities, and actors"* (Project Manager D). Facilitators also became part of this mutual learning dynamic, both sharing knowledge and receiving new insights from participants' local practices.

Some participants left with concrete action plans, while others gained clarity on which ideas were less feasible. In both cases, the game served as a space to test ambition against feasibility. As one facilitator put it, *"It's not just about what they learn from the game, but also how they perceive the complexity of the project and their role in it"* (Project Manager D). The primary aim was not to produce polished outcomes, but to give participants a first-hand experience of the game and allow them to reflect on how it might support green efforts in their own departments.

The session unfolded with energy and focus. At several tables, dialogue continued through breaks. Participants described how the structure helped move from ambition to concrete planning.

In the final plenary, 88% stood up in response to the question: *"Can the game help make your work with green transition more concrete and action-oriented?"*

Survey responses pointed to four themes, each highlighting a different dimension of participant engagement and learning:

- **Process & Learning**: *"A good way to make it concrete."* / *"Helped me see my role more clearly."* / *"Ongoing reflection - change requires effort."*
- **Dialogue & Input:** *"Great way to share viewpoints."* / *"Could be used at a departmental theme day."*
- **Activation & Motivation**: *"It made green transitions more tangible and fun."* / *"Helped break things down - a good way to begin."*
- **Reservations**: *"Too complicated."* / *"Only works with a facilitator."* / *"There's no time for this in my department."*

Project Manager D called it *"overall a positive experience,"* while Project Manager B noted that *"even though the task felt large, the game was really effective."* Project Manager A concluded: *"It can be used for both Green Ambassadors and broader climate initiatives."*

Staging Moves - Workshop 2: Strategically Supporting Employee-Led Climate Action

This workshop was deliberately staged as a negotiation game-based intervention to support locally anchored, employee-led climate efforts across hospital departments. It drew on The Path to the Climate Jewels not only as a facilitation tool, but as a strategic - yet playful - platform for enabling competence-building, shared reflection, and the development of small-scale sustainability initiatives.

(a) Interpreting and (Re)Framing: Enabling Local Climate Action Through Practice-Based Dialogue

This workshop was embedded in the Green Ambassador training programme - co-developed with two project managers with responsibility for the education - and served as both a learning module and a strategic test of the game's fit with real-world employee initiatives.

The session was framed not as a theoretical exercise but as a chance to explore how The Path to the Climate Jewels might support everyday climate efforts within clinical departments. Participants were encouraged to generate new ideas on the spot, rather than relying on pre-existing projects, in order to engage the full logic of the game - from idea to action plan.

This framing aligned closely with Arena 2's concern for competence building, local ownership, and practical climate action. At the same time, it left room for Arena 1 concerns (e.g. time constraints, workflow realities, patient safety) to surface through participants' own reflections.

The overall aim was not only to familiarise participants with the game, but to cultivate their role as future game ambassadors - able to introduce, host, or adapt the game in their own departments.

(b) Inviting and Facilitating: Supporting Structured Participation Across Groups

Participants were enrolled in the Green Ambassador training programme and had been selected by their respective departments to take part in employee-led climate work. Most were clinicians - e.g. nurses and healthcare assistants - but the groups also included non-clinical staff such as logistics coordinators and kitchen assistants. All participants were actively involved in the green transition at their hospitals and represented a wide range of institutions across the region.

Participants were seated in the same groups they had worked with throughout the training day. As mutual familiarity was already established, the game's standard introductory round - where players typically introduce themselves and their role - was deliberately omitted.

Facilitation was distributed across six parallel game sessions. Each table was supported by a dedicated facilitator - either a project manager or a member of the design team. The two programme leads opened and closed the session in plenary, while a floating facilitator maintained timing, supported transitions, and ensured coherence across groups.

Participation was scaffolded by three simple process rules:

- Each participant contributed at least one idea;
- One idea was selected for further development;
- The "idea owner" was relieved of notetaking to focus on discussion.

The overall facilitation strategy prioritised structure and progression while remaining responsive to the situated concerns and collaborative reasoning that emerged within each group.

(c) Inscribing the Game: Simplifying Materials and Anchoring Systemic Thinking in Familiar Practice

To fit the session's 90-minute timeframe and support first-time engagement, several adjustments were made to the game's standard materials and flow:

- A visual slide deck structured the game in plenary, ensuring shared orientation across all tables.
- Each table received simplified handouts for brainstorming, prioritising, and mapping stakeholders.
- Facilitators followed a shared script to maintain consistency across groups.

Importantly, System Layer Cards were modified in two ways:

- They were only introduced after the brainstorming phase, rather than at the beginning, to reduce cognitive load.
- They featured new backside examples, specifically tailored to resonate with the kind of small-scale, tangible initiatives common in employee-led efforts (see Figure 42). The glove reduction example - already known to participants - was used to show how one initiative could cut across behavioural, technological, and policy layers.

The usual game introduction - where players explain their role and context - was also omitted, as participants were already seated in the same groups used throughout the day and were familiar with one another.

Together, these inscriptions lowered the threshold for engagement while still supporting systemic thinking. The props functioned as mediators, helping participants link their own practices to broader organisational structures - without requiring in-depth policy knowledge or managerial authority.

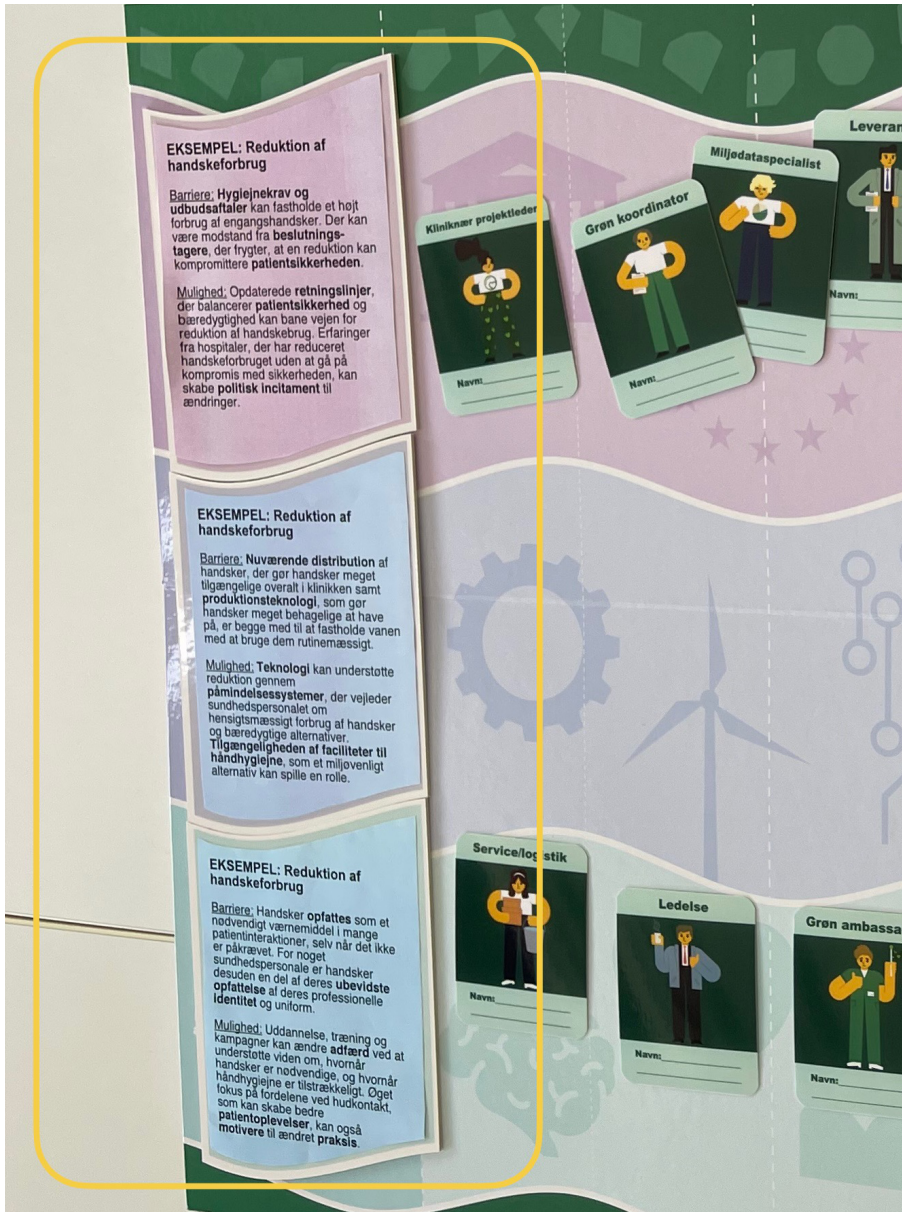


Figure 42: System Layer Cards re-inscribed with context-specific examples on the reverse. Examples were adapted from the official game rulebook, reformatted to match the card layout, printed, and affixed with tape specifically for this workshop.

5 Design Results

5.1 How to configure Negotiation Spaces for Climate Action Across Arenas

The two workshops offer a valuable contrast in how negotiation can be strategically staged to align climate ambitions with clinical realities. Despite their differing scopes, one systemic, the other local, both illuminate the challenge of embedding Arena 2 (green transition) efforts within the operational constraints of Arena 1 (healthcare delivery).

Shared Conditions, Divergent Needs

Both workshops were shaped by similar structural tensions: limited time, clinical responsibilities, shifting roles, and the challenge of translating discussion into action. However, the nature of these tensions and how best to respond differs based on the project's scale and complexity.

In **Workshop 1**, centred on a cross-site clinical case, the negotiation space needed to be structured, anchored, and authoritative. Participants were selected for their formal mandates, and the session was framed around existing workflows and systemic reform. Facilitation required strategic competence, domain knowledge, and the ability to navigate hierarchy.

By contrast, **Workshop 2** supported bottom-up action in a local, exploratory setting. Facilitation focused on scaffolding and empowerment, helping participants surface and prioritise ideas in real time. The setting allowed for quick moves towards action but required additional effort to ensure post-workshop momentum and departmental follow-through.

Strategic Implications for Staging

The structured comparison that follows distils these insights into a set of practical recommendations (see table 5 on the next page). It illustrates how differences in purpose, complexity, participant composition, and facilitation needs must shape how the negotiation is staged.

Hospital-led climate efforts require alignment with existing strategies, formal authority in the room, and deep knowledge of the system. Without this, even technically sound proposals may struggle to take root.

Employee-led climate efforts benefit from a lower threshold to participation, strong team-based familiarity, and guided prioritisation. In these contexts, simplicity and ownership are critical to success.

This reinforces a key insight from both settings: Arena 2 is not separate from Arena 1 - it negotiates with it. Whether through formal strategic alignment or local ownership, success depends on how well the climate ambition is grounded in existing practices and relationships.

Table 5: Structured Comparison and Recommendation of Negotiation Spaces

A) Interpreting Purpose and Framing

Dimension	**Hospital-led** (Systemic-Scale)	**Employee-led** (Small-Scale)
Purpose	Initiate green action within and across departments	Initiate green action in local departments
Scope and Location	Alignment on clinical pathways and systemic transformation. Cross-hospital play can support benchmarking and shared learning, but local, cross-disciplinary groups may be equally effective for implementation	Situated use of the game at department level enables alignment among peers and supports ownership and action. Cross-hospital settings can offer inspiration but are not required for real impact
Main project focus	Complex clinical workflows and processes (e.g. diagnostics, care pathways)	Practical routines and materials (e.g. waste sorting, substituting products)
Project complexity	High - requires coordination across roles and departments	Low to medium - typically within own team or unit
Participant preparation	Preparation is not required, but recommended. Ideally bring clinical guidelines or a focused case if available.	No preparation required - ideas surface during the game
Core Framing	Needs anchoring in clinical logic and department goals	Should emphasise exploration, feasibility, and shared ownership
Timeframe	Minimum 2 hours to allow for deep negotiation and reframing	Also 2 hours to allow exploration of several small jewels and shared understanding

B) Inviting and Facilitating

Dimension	**Hospital-led** (Systemic-Scale)	**Employee-led** (Small-Scale)
Group composition	Cross-disciplinary with formal mandate holders is recommended. A hygiene expert can be consulted in risk-cases	Colleagues from the same department to support alignment is recommended
Facilitation demands	Strategic, bridging, domain-aware - must handle complexity and seniority	Distributive, motivational, context-sensitive - must support peer dialogue and overcome initial hesitancy
Facilitator profile	Experienced facilitators (e.g. Project Managers or Green Coordinators) with system knowledge, clinical insight, and climate literacy	Experienced facilitators (e.g. Green Coordinators), must feel comfortable scaffolding and adapting
Shared facilitator skills	- Translate game logic to practice - Mirror discussions - Distribute roles - Maintain flow - Guide prioritisation - React to group dynamics - Create a safe, reflective space	- Translate game logic to practice - Mirror discussions - Distribute roles - Maintain flow - Guide prioritisation - React to group dynamics - Create a safe, reflective space

C) Inscribing Games

Dimension	**Hospital-led** (Systemic-Scale)	**Employee-led** (Small-Scale)
Materials	PowerPoint (incl. Game rules) tailored to context. Contextual examples should match challenges and system priorities	PowerPoint (incl. Game rules) tailored to context. Contextual examples should reflect participants' routines and realities

D) Moves towards Action		
Dimension	**Hospital-led** (Systemic-Scale)	**Employee-led** (Small-Scale)
Output	Action plans with concrete starting points, linked to system goals	Action plans focused on immediate change and local motivation
Implementation	Varies by complexity, may require integration into strategies and follow-up	Depends on motivation, success relies on self-driven follow-up
Typical risks	Overstretching ambition, unclear ownership, failing to involve decision-makers, difficulty transferring plans to team	Overambitious jewels, lack of follow-up, difficulty transferring plans to team

The Game as a Strategic Tool

In both workshops, The Path to the Climate Jewels functioned not only as a facilitation device but as a strategic platform for cross-arena negotiation. When tailored to its context, the game enabled shared reflection, surfaced overlooked dependencies, and translated broad ambitions into realistic next steps.

Its adaptability proved essential: it could support both detailed system-level planning and spontaneous idea generation - but only when the staging moves (framing, invitation, inscription) were carefully designed. As the comparison shows game logic should always be adapted to context, not applied as a one-size-fits-all game session.

Designing for Strategic, Situated Negotiation

The two workshops show that The Path to the Climate Jewels does more than facilitate planning - it stages a temporary development arena where healthcare professionals can navigate the tension between Arena 1 (healthcare delievery) and Arena 2 (green transition). Rather than forcing alignment, the game creates moments of strategic overlap, where clinical logic and climate ambition are jointly examined, questioned, and recalibrated.

These findings suggest that negotiation spaces should be carefully configured in the arena, to the project's complexity, and the participants involved. The hospital-led and employee-led formats are not opposing models, but complementary ends of a continuum - from structured cross-site strategy to exploratory, team-based action learning.

Healthcare climate transition will likely require both:

- **Cross-site spaces** to revise workflows, guidelines, and system structures.
- **Local arenas** where staff can take ownership and build momentum from within.

As Deputy Head Midwife from the partner hospital noted after Workshop 1, the game came at just the right moment. Her team, "hungry" for deeper change, used it to question entrenched routines and commit to rethinking care pathways. What lingered, she said, wasn't just the format - it was the mindset shift: shared reflection, grounded planning, and the rare clarity of naming who does what, and by when (App. D).

This confirms a central insight: Arena 2 cannot simply be added onto Arena 1 - it must be enacted from within it. The game supports this by offering a space where professionals can make sustainability part of how they define and deliver good care.

As Deputy Head Midwife put it, *"We've taken the first step, so it's no longer a huge ordeal [to initiate system-level changes]."* (pers. comm., 13.05.25; App. D)**.** The challenge now is ensuring more departments can do the same - by staging negotiations that are strategic, situated, and ready to matter.

6 Discussion

6.1 Strengths and limitations

While this thesis is grounded in a single regional context, the findings reflect broader patterns observed in the literature on sustainable healthcare transitions. Through the lens of the Arenas of Development (AoD) framework, the analysis reveals structural and cultural disconnections between strategic climate efforts and the implementation in clinical practice, echoing widely documented barriers such as time constraints, siloed responsibilities, and deeply rooted concerns about patient safety. The Path to the Climate Jewels responds directly to enabling conditions identified in literature, namely the importance of interdisciplinary collaboration, professional engagement, and visible leadership, by staging structured spaces where these can be activated and aligned in practice. Drawing on the framework of Staging Negotiation Spaces (SNS), the study demonstrates how participatory tools can be deliberately configured to surface, negotiate, and reframe conflicting concerns, making room for collaborative action despite institutional constraints. The study thus contributes to the research field by demonstrating how game-based design tools, when applied strategically and contextually, can support situated, practice-oriented sustainability transitions within complex healthcare organisations.

In participatory design literature, games are often positioned as tools for designers to understand user needs and foster mutual learning between designers and other relevant actors (Brandt, 2006; Pedersen & Dorland, 2025). In contrast, The Path to the Climate Jewels was not designed primarily for the benefit of the design team, but as a finished tool intended to be used independently by the project managers and healthcare professionals. The game serves as a practical instrument for clinicians to negotiate, initiate, and coordinate concrete sustainability actions within their work settings. Importantly, the primary recipients of the game's outcomes are not the design team but the clinicians themselves, who are held accountable for acting upon the co-created action plans. This shift in ownership repositions the role of the game, from a design prop to an organisational framework, underscoring the importance of building local facilitation capacity to support its continued use and positions the game as a practical contribution to the operationalisation of sustainability strategies in healthcare.

However, the study also recognises that the outcome of the game is contingent upon participants' presence, time, and mental availability; resources that are often in short supply in clinical environments. While the facilitation of the game enables collaborative identification, prioritisation, and coordination of actions, it cannot, by itself, overcome barriers such as staffing shortages or the absence of leadership support. This underscores the need for structured follow-up and protected time if participatory tools aimed at initiating action can lead to practical implementation.

Considering the design-based nature of this study, the design team has held a dual role as both researchers and facilitators. While this provides deep insight into the situated use of the tool, it may also introduce bias. To mitigate this, the analysis has been guided by the SNS frameworks' staging moves, addressing how the design team's participation shaped the outcomes observed.

The empirical material is based on a limited number of workshops, which may constrain the range of perspectives captured. However, the selected cases provide in-depth, situated insights into both the potential and constraints of the use of game-based tools in sustainable healthcare transitions.

Together, these strengths and limitations reflect the complexity of embedding sustainability in clinical settings and highlight the value and challenges of participatory approaches that seek to bridge strategic ambition and everyday healthcare practice.

6.2 Implications for practice

The study suggests that participatory game-based tools can support the alignment of otherwise disconnected concerns across clinical practice and sustainability strategy. For healthcare organisations, this implies that tools like The Path to the Climate Jewels should not be introduced as standalone interventions but embedded within facilitation processes supported by leadership and tied to existing climate governance structures. We recommend:

- That sustainability efforts in healthcare are supported by participatory tools that create time-limited but structured negotiation spaces, especially where implementation of strategic goals requires coordinated actions by healthcare staff.
- That facilitation competencies are built within organisations (e.g. among project managers or green coordinators) to ensure continuity and adaptation.
- That hospital leadership actively supports such initiatives by allocating time, legitimising participation, and creating follow-up mechanisms to ensure implementation of the co-created action plans.

While the tool was designed within a Danish regional context, the approach has broader relevance for healthcare systems facing similar gaps between ambition and implementation. For design practitioners, the study highlights the value of using staged, co-designed negotiation games to align diverse professional concerns and promote collective ownership of sustainability efforts.

6.3 Implications for research

This study underscores the need for further design research that engages with sustainability transitions *from within,* allowing designers to co-shape and study change in context, rather than from a distance. Future studies could further explore how participatory game-based tools can support implementation and up-scaling of sustainability efforts across clinical and managerial levels, and investigate how such tools evolve over time, particularly how they affect actions for sustainable change in a long-term perspective.

7 Conclusion

This thesis set out to explore how the participatory, game-based tool The Path to the Climate Jewels can support the operationalisation of sustainability strategies by engaging clinicians in initiating and coordinating concrete actions within hospital settings. The study specifically investigated not only whether the tool could help translate strategic ambitions into practice, but also how its facilitation and contextual framing influence its capacity to initiate meaningful engagement and action.

Through an arena-based analysis, the research demonstrated how the game can act as a mediating intervention between the distinct but overlapping arenas of healthcare delivery and green transition. By strategically staging negotiation spaces, the game enabled actors from diverging actor-worlds - such as frontline clinical staff, senior clinicians, departmental managers, and project managers - to surface, articulate, and reframe their concerns. In doing so, it fostered alignment without demanding consensus, and crucially, supported the initiation of locally grounded, coordinated sustainability actions.

The findings underscore that the game's transformative potential lies not only in its material design, but in how it is embedded within institutional structures, facilitated to support inclusive participation, and adapted to the specific dynamics of clinical settings. When carefully staged, the game supported professional engagement, interdisciplinary collaboration, and organisational alignment - identified in the literature as key enablers of sustainable practice.

Ultimately, this research contributes both practical recommendations for staging and facilitating the use of the game and design research insights into how participatory tools can create temporary, yet powerful, spaces for negotiation and mutual learning. Tools like The Path to the Climate Jewels can serve as catalysts for sustainability transitions - provided they are supported by ongoing facilitation, strategic anchoring, and commitment across institutional levels. In this way, the game becomes more than an intervention; it becomes a dynamic infrastructure for co-creating and initiating change in healthcare.

8 References

Aboueid, S., Beyene, M., & Nur, T. (2023). Barriers and enablers to implementing environmentally sustainable practices in healthcare: A scoping review and proposed roadmap. *Healthcare Management Forum*, *36*(6), 405–413. https://doi.org/10.1177/08404704231183601

Abuzaid, M. M., & Almuqbil, N. (2025). Charting a sustainable future in radiology: Evaluating radiologists' knowledge, attitudes, and practices toward environmental responsibility. *Insights into Imaging*, *16*(1), 39. https://doi.org/10.1186/s13244-025-01917-7

Aronsson, J., Clarke, D., Grose, J., & Richardson, J. (2020). Student nurses exposed to sustainability education can challenge practice: A cohort study. *Nursing & Health Sciences*, *22*(3), 803–811. https://doi.org/10.1111/nhs.12734

Badanta, B., Porcar Sierra, A., Fernández, S. T., Rodríguez Muñoz, F. J., Pérez-Jiménez, J. M., Gonzalez-Cano-Caballero, M., Ruiz-Adame, M., & de-Diego-Cordero, R. (2025). Advancing Environmental Sustainability in Healthcare: Review on Perspectives from Health Institutions. *Environments*, *12*(1), 9. https://doi.org/10.3390/environments12010009

Badawy, W., Shaban, M., Elsayed, H. H., & Hashim, A. (2024). Eco-conscious nursing: Qualitative analysis of nurses' engagement with environmental sustainability in healthcare. *Teaching and Learning in Nursing*, S155730872400249X. https://doi.org/10.1016/j.teln.2024.11.019

Bajwa, B., Zhang, Z., Tuen, Y. J., Courtemanche, R., & S. Arneja, J. (2025). How Can Non-Hospital Surgical Centres Improve Their Environmental Footprint (and Reduce Costs)? *Plastic Surgery*, 22925503241305635. https://doi.org/10.1177/22925503241305635

Bate, P., & Robert, G. (2006). Experience-based design: From redesigning the system around the patient to co-designing services with the patient. *Quality and Safety in Health Care*, *15*(5), 307–310. https://doi.org/10.1136/qshc.2005.016527

Boussuge-Roze, J., Boveda, S., Mahida, S., Anic, A., Conte, G., Chun, J. K. R., Marijon, E., Sacher, F., & Jais, P. (2022). Current practices and expectations to reduce environmental impact of electrophysiology catheters: Results from an EHRA/LIRYC European physician survey. *EP Europace*, *24*(8), 1300–1306. https://doi.org/10.1093/europace/euac085

Brandt, E. (2006). *Designing Exploratory Design Games: A Framework for Participation in Participatory Design?*

Callon, M. (1986a). Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay. In J. Law, *Power, action and belief: A new sociology of knowledge?* (Vol. 32, pp. 196–233). Routledge. https://journals.sagepub.com/doi/10.1111/j.1467-954X.1984.tb00113.x

Callon, M. (1986b). The Sociology of an Actor-Network: The Case of the Electric Vehicle. In M. Callon, J. Law, & A. Rip (Eds.), *Mapping the Dynamics of Science and Technology* (pp. 19–34). Palgrave Macmillan UK. https://doi.org/10.1007/978-1-349-07408-2_2

Cavicchi, C., Oppi, C., & Vagnoni, E. (2022). Back and Forth on Sustainable Development: A Focus on Healthcare Organisations. *Sustainability*, *14*(9), 4958. https://doi.org/10.3390/su14094958

Center for offentlig-privat innovation. (2022). *Ny forretningsgang sætter innovative sundhedsindkøb i system*. http://www.co-pi.dk/nyheder/ny-forretningsgang-saetter-innovative-sundhedsindkoeb-i-system/

Center for Patientinddragelse. (n.d.). *Beslutningsstøtteværktøjer udviklet af CPI*. Region H. Retrieved 27 May 2025, from https://www.regionh.dk/patientinddragelse/patientinddragelse/faelles_beslutningstagning/Sider/CPIs-beslutningsstottevaerktojer.aspx

Cowie, J., Nicoll, A., Dimova, E. D., Campbell, P., & Duncan, E. A. (2020). The barriers and facilitators influencing the sustainability of hospital-based interventions: A systematic review. *BMC Health Services Research*, *20*(1), 588. https://doi.org/10.1186/s12913-020-05434-9

Danske Regioner. (n.d.). *Om de fem regioner*. Danske Regioner. Retrieved 25 May 2025, from https://www.regioner.dk/om-os/om-de-fem-regioner/

Danske Regioner. (2023). *En fællesregional strategi for Grønne Hospitaler* (pp. 1–28). Danske regioner.

Den Grønne Puls. (2025, January 16). Grøn omstilling handler ofte om optimerede arbejdsgange. [Social Media]. *Grøn Omstilling Handler Ofte Om Optimerede Arbejdsgange.* https://www.instagram.com/reel/DE5OFfuMdHT/utm_source=ig_web_copy_link&igsh=MzRlODBiNWFlZA==

Design Council. (n.d.). *The Double Diamond—A universally accepted depiction of the design process*. Retrieved 15 May 2025, from https://www.designcouncil.org.uk/our-resources/the-double-diamond/

DesRoche, C., Soulez, G., Boucher, L., Fohlen, A., & Menard, A. (2025). Steps Toward Environmental Sustainability in Interventional Radiology. *Canadian Association of Radiologists Journal*, 08465371251326793. https://doi.org/10.1177/08465371251326793

Donetto, S., Pierri, P., Tsianakas, V., & Robert, G. (2015). Experience-based Co-design and Healthcare Improvement: Realizing Participatory Design in the Public Sector. *The Design Journal*, *18*(2), 227–248. https://doi.org/10.2752/175630615X14212498964312

Farzad, M., Naqui, Z., MacDermid, J., & Cuypers, S. (2024). Sustainable practices in hand therapy: A global perspective. *Journal of Hand Surgery (European Volume)*, *49*(8), 1051–1056. https://doi.org/10.1177/17531934241246451

Gaardhøj, L. (2023, August 30). Klimaftrykket skal halveres i Region Hovedstaden inden 2030. *Sjællandske Nyheder*. https://www.sn.dk/art504594/sjaelland/debat-sjaelland/debat-klimaftrykket-skal-halveres-i-region-hovedstaden-inden-2030/

Gkouliaveras, V., Kalogiannidis, S., Kalfas, D., & Kontsas, S. (2025). Effects of Climate Change on Health and Health Systems: A Systematic Review of Preparedness, Resilience, and Challenges. *International Journal of Environmental Research and Public Health*, *22*(2), 232. https://doi.org/10.3390/ijerph22020232

Global climate & health alliance. (2020, October 1). NHS England Net Zero Carbon Emissions Commitment Sets Example for Health Services Around the World. *The Global Climate and Health Alliance*. https://climateandhealthalliance.org/press-releases/nhs-england-net-zero-carbon-emissions-commitment-sets-example-for-health-services-around-the-world/

Guihenneuc, J., Cambien, G., Blanc-Petitjean, P., Papin, E., Bernard, N., Jourdain, B., Barcos, I., Saez, C., Dupuis, A., Ayraud-Thevenot, S., & Migeot, V. (2024). Knowledge, behaviours, practices, and expectations regarding climate change and environmental sustainability among health workers in France: A multicentre, cross-sectional study. *The Lancet Planetary Health*, *8*(6), e353–e364. https://doi.org/10.1016/S2542-5196(24)00099-8

Health Care Without Harm. (2019). *HEALTH CARE'S CLIMATE FOOTPRINT - HOW THE HEALTH SECTOR CONTRIBUTES TO THE GLOBAL CLIMATE CRISIS AND OPPORTUNITIES FOR ACTION*.

Howard, J., Tasker, L. H., Fisher, Z., & Tree, J. (2024). Assessing the use of co-design to produce bespoke assistive technology solutions within a current healthcare service: A service evaluation. *Disability and Rehabilitation: Assistive Technology*, *19*(1), 42–51. https://doi.org/10.1080/17483107.2022.2060355

Jia, F., Aboagye, S., Shahzadi, G., & Chen, L. (2025). Sustainable practices in healthcare supply chains: A review of strategies, challenges, and impacts. *International Journal of Logistics Research and Applications*, 1–25. https://doi.org/10.1080/13675567.2025.2461102

Jones, P., & Arun Kumar, P. (2023). Formative Interventions for Healthcare Sustainability: A Developmental Design Agenda. In M. A. Pfannstiel (Ed.), *Human-Centered Service Design for Healthcare Transformation* (pp. 177–195). Springer International Publishing. https://doi.org/10.1007/978-3-031-20168-4_11

Jørgensen, U. (2012). Mapping and navigating transitions—The multi-level perspective compared with arenas of development. *Research Policy*, *41*(6), 996–1010. https://doi.org/10.1016/j.respol.2012.03.001

Jørgensen, U., & Sørensen, O. (2002). Arenas of Development: A Space Populated by Actor-worlds, Artefacts, and Surprises. In K. H. Sørensen & R. Williams (Eds.), *Shaping Technology, Guiding Policy* (pp. 197–222). Edward Elgar Publishing. https://doi.org/10.4337/9781035352937.00015

Kotcher, J., Badullovich, N., Ahmed, M., De Alwis, D., & Maibach, E. W. (2024). Role model stories can increase health professionals' interest and perceived responsibility to engage in climate and sustainability actions. *The Journal of Climate Change and Health*, *18*, 100291. https://doi.org/10.1016/j.joclim.2023.100291

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Harvard University press.

Latour, B. (2008). *What Is the Style of Matters of Concern? Two Lectures in Empirical Philosophy*. Van Gorcum.

Law, J. (2008). Actor Network Theory and Material Semiotics. In B. S. Turner (Ed.), *The New Blackwell Companion to Social Theory* (1st ed., pp. 141–158). Wiley. https://doi.org/10.1002/9781444304992.ch7

Marin-Garcia, J. A., Garcia-Sabater, J. J., Garcia-Sabater, J. P., & Maheut, J. (2020). Protocol: Triple Diamond method for problem solving and design thinking. Rubric validation. *WPOM-Working Papers on Operations Management*, *11*(2), 49–68. https://doi.org/10.4995/wpom.v11i2.14776

Masterson, D., Areskoug Josefsson, K., Robert, G., Nylander, E., & Kjellström, S. (2022). Mapping definitions of co-production and co-design in health and social care: A systematic scoping review providing lessons for the future. *Health Expectations*, *25*(3), 902–913. https://doi.org/10.1111/hex.13470

Miljø- og klimaudvalget. (2025). *Møde i miljø- og klimaudvalget den 19. Marts 2025*. https://www.regionh.dk/politik/nye-moeder/Sider/M%C3%B8de-i-milj%C3%B8--og-klimaudvalget-den-19.-marts-2025.aspx#5_itemID_103014

Østervang, C., Lassen, A., Schmidt, T., Coyne, E., Dieperink, K. B., & Jensen, C. M. (2022). Development of a health information system to promote emergency care pathways: A participatory design study. *DIGITAL HEALTH*, *8*, 205520762211458. https://doi.org/10.1177/20552076221145856

Palmer, V. J., Weavell, W., Callander, R., Piper, D., Richard, L., Maher, L., Boyd, H., Herrman, H., Furler, J., Gunn, J., Iedema, R., & Robert, G. (2019). The Participatory Zeitgeist: An explanatory theoretical model of change in an era of coproduction and codesign in healthcare improvement. *Medical Humanities*, *45*(3), 247–257. https://doi.org/10.1136/medhum-2017-011398

Pavli, A., Loblay, V., Rychetnik, L., & Usherwood, T. (2023). What can we learn from Australian general practices taking steps to be more environmentally sustainable? A qualitative study. *Family Practice*, *40*(3), 465–472. https://doi.org/10.1093/fampra/cmad027

Pedersen, S. (2020). Staging negotiation spaces: A co-design framework. *Design Studies*, *68*(May), 58–81. https://doi.org/10.1016/j.destud.2020.02.002

Pedersen, S., Bogers, M. L. A. M., & Clausen, C. (2022). Navigating collaborative open innovation projects: Staging negotiations of actors' concerns. *Creativity and Innovation Management*, *31*(2), 306–321. https://doi.org/10.1111/caim.12492

Pedersen, S., & Brodersen, S. (2020). Circulating objects between frontstage and backstage: Collectively identifying concerns and framing solution spaces. In C. Clausen, D. Vinck, S. Pedersen, & J. Dorland (Eds.), *Staging Collaborative Design and Innovation*. Edward Elgar Publishing. https://doi.org/10.4337/9781839103438.00014

Pedersen, S., & Clausen, C. (forthcoming). Inviting actors onto the arena: An actionable approach to designing responsibly. *Journal of Responsible Innovation*.

Pedersen, S., & Dorland, J. (2025). Staging situated negotiation games for (re)designing local healthcare facilities and services. *Design for Health*, 1–27. https://doi.org/10.1080/24735132.2025.2454731

Pedersen, S., Dorland, J., & Clausen, C. (2020). Staging: From theory to action. In C. Clausen, D. Vinck, S. Pedersen, & J. Dorland (Eds.), *Staging Collaborative Design and Innovation*. Edward Elgar Publishing. https://doi.org/10.4337/9781839103438.00010

Poo, S. X. W., Kader, R., Shakweh, E., Kronsten, V. T., Baddeley, R., Gastroenterology London Investigative Network for Trainees Study Group (GLINT), Siddhi, S., & Hayee, B. (2025). Survey of the endoscopy workforce's perception of sustainability. *Frontline Gastroenterology*, *16*(2), 116–123. https://doi.org/10.1136/flgastro-2024-102807

Rafiei, S., Honary, M., Mezes, B., & Flowers, S. (2025). Co-designing implementation strategies for social prescribing in Lancashire and South Cumbria: A qualitative study with a participatory approach. *BMJ Open*, *15*(4), e094522. https://doi.org/10.1136/bmjopen-2024-094522

Region H. (n.d.). *Klimaindsatser i Grøn2030-programmet*. Retrieved 16 May 2025, from https://www.regionh.dk/til-fagfolk/Klima-og-miljoe/groen-omstilling-af-hospitalerne/groen2030-hvad-er-det/Sider/Klimaindsatser-i-Groen2030-programmet.aspx

Region H. (2024a). *Hospitalsplan-2025*. https://www.regionh.dk/til-fagfolk/Sundhed/hospitaler/HOPP/Documents/Hospitalsplan-2025.pdf

Region H. (2024b). *Region Hovedstaden tager store skridt mod en grønnere fremtid*. https://www.regionh.dk/presse-og-nyt/pressemeddelelser-og-nyheder/Sider/Region-Hovedstaden-tager-store-skridt-mod-en-groennere-fremtid.aspx

Rouhana, R., & Van Caillie, D. (2025). How do performance monitoring systems support sustainability in healthcare? *Society and Business Review*. https://doi.org/10.1108/SBR-07-2024-0244

Sepetis, A., Parlavatzas, I., Zaza, P. N., Platis, C., Fotios, R., & Nikolaou, I. E. (2024). The Role of Organizational Behavior to Sustainable Health Care: The Case of Greece. *Environmental Health Insights*, *18*, 11786302241298788. https://doi.org/10.1177/11786302241298788

Sijm-Eeken, M., Greif, A., Peute, L., & Jaspers, M. (2024). Implementation of Green Lean Six Sigma in Dutch Healthcare: A Qualitative Study of Healthcare Professionals' Experiences. *Nursing Reports*, *14*(4), 2877–2895. https://doi.org/10.3390/nursrep14040210

Sijm-Eeken, M., Ossebaard, H. C., Čaluković, A., Temme, B., Peute, L. W., & Jaspers, M. W. (2024). Linking theory and practice to advance sustainable healthcare: The development of maturity model version 1.0. *BMC Health Services Research*, *24*(1), 1350. https://doi.org/10.1186/s12913-024-11749-8

Simonsen, J., & Robertson, T. (2013). *Routledge international handbook of participatory design*. Routledge. https://doi.org/10.4324/9780203108543

Smale, E., Baid, H., Balan, M., McGain, F., McAlistar, S., De Waele, J. J., Diehl, J. C., Van Raaij, E., Van Genderen, M., Tibboel, D., & Hunfeld, N. (2025). The green ICU: How to interpret green? A multiple perspective approach. *Critical Care*, *29*(1), 80. https://doi.org/10.1186/s13054-025-05316-8

Spicer, N., Agyepong, I., Ottersen, T., Jahn, A., & Ooms, G. (2020). 'It's far too complicated': Why fragmentation persists in global health. *Globalization and Health*, *16*(1), 60. https://doi.org/10.1186/s12992-020-00592-1

Spitters, H. P. E. M., Van Oers, J. A. M., Sandu, P., Lau, C. J., Quanjel, M., Dulf, D., Chereches, R., & Van De Goor, L. A. M. (2017). Developing a policy game intervention to enhance collaboration in public health policymaking in three European countries. *BMC Public Health*, *17*(1), 961. https://doi.org/10.1186/s12889-017-4963-7

Sumrit, D. (2025). Pathway to achieve net-zero emission in healthcare sector based on the natural resource-based view theoretical lens: A hybrid DEMATEL-ISM-MICMAC approach. *Cleaner Engineering and Technology*, *25*, 100916. https://doi.org/10.1016/j.clet.2025.100916

Sundhedsaftalen. (2023). *Sundhedsaftale 2024-2027*. https://www.regionh.dk/Sundhedsaftale/Vaerktoejskasse/Documents/Sundhedsaftale%202024-2027.pdf

The Guardian. (2021, September 5). More than 200 health journals call for urgent action on climate crisis. *The Guardian*. https://www.theguardian.com/environment/2021/sep/06/more-than-200-health-journals-call-for-urgent-action-on-climate-crisis

Thøstesen, J. E., Sørensen, K. E. G., Jensen, M. G., Vogel, N. S., & Gilbu, U. (2024). *PRACTICE-ORIENTED DESIGN: RECONFIGURING PROFESSIONAL HEALTHCARE PRACTICES FOR SUSTAINABILITY* (p. 67). Aalborg University Copenhagen.

Tordjman, M., Pernod, C., Bouvet, L., & Lamblin, A. (2022). Environmentally Sustainable Practices in the Operating Room: A French Nationwide Cross-Sectional Survey of Anaesthesiologists and Nurse Anaesthesiologists. *Turkish Journal of Anaesthesiology and Reanimation*, *50*(6), 424–429. https://doi.org/10.5152/TJAR.2022.21410

Vælg Klogt. (n.d.). *Om Vælg Klogt*. Retrieved 20 May 2025, from https://vaelgklogt.dk/om-vaelg-klogt

Vinck, D. (2012). Accessing Material Culture by Following Intermediary Objects. In L. Naidoo (Ed.), *An Ethnography of Global Landscapes and Corridors*. InTech. https://doi.org/10.5772/34719

Vinck, D., & Jeantet, A. (1995). *Mediating and Commissioning Objects in the Sociotechnical Process of Product Design: A conceptual approach* (pp. 111–129).

Vogel, N. S., & Gilbu, U. L. (2025). *STAGING PARTICIPATORY DESIGN IN A HEALTHCARE ORGANISATION: CO-CREATING A DESIGN GAME TO FACILITATE THE IMPLEMENTATION OF SUSTAINABLE INNOVATION INITIATIVES* (p. 51). Aalborg University Copenhagen.

Westwood, E., Walshaw, J., Boag, K., Chua, W., Dimashki, S., Khalid, H., Lathan, R., Wellington, J., Lockwood, S., & Yiasemidou, M. (2023). Time for change: Compliance with RCS green theatre checklist—facilitators and barriers on the journey to net zero. *Frontiers in Surgery*, *10*, 1260301. https://doi.org/10.3389/fsurg.2023.1260301

Whitmee, S., Haines, A., Beyrer, C., Boltz, F., Capon, A. G., Dias, B. F. de S., Ezeh, A., Frumkin, H., Gong, P., Head, P., Horton, R., Mace, G. M., Marten, R., Myers, S. S., Nishtar, S., Osofsky, S. A., Pattanayak, S. K., Pongsiri, M. J., Romanelli, C., … Yach, D. (2015). Safeguarding human health in the Anthropocene epoch: Report of The Rockefeller Foundation–Lancet Commission on planetary health. *The Lancet*, *386*(10007), 1973–2028. https://doi.org/10.1016/S0140-6736(15)60901-1

World Health Organization. (2017). *Environmentally sustainable health systems: A strategic document*.

World Health Organization. (2023). *Uniting for Health and Climate Action*. https://www.who.int/teams/environment-climate-change-and-health/call-for-climate-action

Zoromba, M. A., & EL-Gazar, H. E. (2025). Nurses' attitudes, practices, and barriers toward sustainability behaviors: A qualitative study. *BMC Nursing*, *24*(1), 437. https://doi.org/10.1186/s12912-025-03023-x

9 List of Appendices

List of Appendices

The appendices are not publicly available due to confidentiality reasons.

Appendix A - Defining criteria for the design game

Appendix B - Selecting a final concept

Appendix C - Test of game prototypes

Appendix D - Workshop 1: Game sessions - hospital-led efforts

Appendix E - Workshop 2: Game sessions - employee-led efforts