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ethical leadership a new frontier for design

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MAPPING THE INTERSECTIONS OF DESIGN AND POLICY: TOWARDS AN ANALYTICAL TAXONOMY OF DESIGN FOR CLIMATE POLICY.

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ABSTRACT | In response to the climate crisis, governments are under increasing pressure to drive transformation across all sectors, from services to policies. This study examines the increasing influence of “design for policy” as a novel approach to policymaking. The aim is to explore how design can meaningfully contribute to climate policy innovation by proposing a structured analytical framework that positions design thinking within this critical policy domain. An integrative literature review is conducted to analyse climate policy through three key dimensions: goals, challenges and processes, adopting the heuristic developed by Kimbell et al. (2023). Three main insights emerge. First, as climate policy goals are often complex and contested, design should be able to negotiate trade-offs, integrate mitigation and adaptation strategies, and support the mainstreaming of climate action in other policy domains. Second, climate policy faces multi-level challenges in terms of spatial, temporal, and institutional differences among the actors involved. Design should facilitate coordination, stakeholder engagement, and the redefinition of roles and responsibilities. Third, the climate policy process requires balancing scientific legitimacy with political feasibility, navigating a shifting political agenda and expanding current measurement indicators. Design should support the rethinking of climate policymaking towards long-term, institutionalised processes of knowledge co-creation; adopt a systems-oriented perspective; and introduce alternative, human-centred indicators. While limited by its theoretical scope, this study offers a practical framework for collaboration between researchers and practitioners working at the intersection of design and climate policy.

KEYWORDS | PUBLIC SECTOR INNOVATION; POLICYMAKING; SUSTAINABILITY TRANSITIONS

1. Design in the climate crisis

On a warming planet, environmental changes are expected to impact socio-economic systems, leading to less favourable conditions for human development and prosperity (Rockström et al., 2009). Vulnerable populations, who have contributed the least to the current climate crisis, are likely to suffer the most and require enormous adaptation efforts, which they often lack the resources and capacity to undertake (Bosello et al., 2009). Governments around the world will need to find strategies to mitigate climate change while adapting to extreme weather events, mass migration and unprecedented environmental conditions (Khan and Roberts, 2013). Although adaptation and mitigation measures have become core elements of public policy and financial resources have been mobilised – see, among others, the European Commission's policy and research programmes such as the European Green Deal and Horizon Europe – the pace of climate policy innovation at all levels of governance appears inadequate when compared to the latest scientific projections of future climate impacts (Jordan and Huitema, 2014). The nexus of climate change, policy and innovation gives new meaning to the recent expansion of design-oriented approaches into the public sector as forces capable of disrupting and innovating traditional administrative structures, processes and policies (Blomkamp, 2018). Governments are not new to applying design principles to public sector services, especially regarding new ways to develop participatory practices and public services co-production (Sanders and Stappers, 2008). In the context of public sector innovation, a variety of design approaches—such as design thinking, service design, and user experience design—are being promoted as a promising development for several reasons. First, design is said to foster creativity and develop the innovation skills of public officials at different levels of government, from national to local. Second, it has been argued that design can integrate insights from different expertise, sources and actors, cutting across the notoriously siloed structures of public bodies and increasing the chances of successful service implementation (Hermus et al., 2020). It is only since the late 1990s, however, that design thinking gained significant attention for policy making (McGann et al., 2018). More recently, the application of design thinking in this public policy developed into a distinct body of literature under the umbrella concept of 'design for policy', coined by Bason (2014), which refers to the adoption of a design approach by policymakers to solve complex policy challenges (e.g. climate change). The initial exploration of design for policy points to three key contributions. First, it offers rich, user-centred research methods that help to uncover the root causes and systemic nature of policy issues (e.g. climate change). Second, it enables collaboration by facilitating co-creation among diverse stakeholders within the policy cycle through visual tools and creative processes (e.g. visual artefacts). Third, it makes policy tangible by designing concepts, services, and experiences that enhance usability, engagement and emotional connection (e.g. prototypes). The recent proliferation of Public Sector Innovation Spaces (PSIs) has accelerated the interest in and spread of design for policy, with some authors suggesting that the PSIs and their toolkits are on their way to becoming a pervasive part of the social infrastructure of modern public organisations (Carstensen and Bason, 2012). However, some authors have questioned whether design thinking can meet the challenges faced by policymakers, whose sectoral knowledge in a specific field of intervention is intertwined with a deep understanding of the politics of policy making. This research aims to explore the potential contributions of design for climate policy by providing a structured analytical framework that situates design for policy characteristics within such a critical and highly political policy domain.

According to Kimbell et al. (2023), the initial conceptualization of design for policy, based on traits like human-centeredness, creativity, anticipation, visualisation, and prototyping, arguably overstates design's uniqueness compared to other disciplines that foster

innovation or integrate lived experience into policy (e.g. sociology, anthropology, future studies). Furthermore, critics highlight design's naivety in addressing politically contentious decisions, scalability, governance models and policy mixes (Clarke & Craft, 2019). While design for policy emphasizes innovation, it tends to neglect how policy processes handle barriers like political feasibility and decision-making, making it less adaptive to address the conflictual nature of democratic instances (Howlett, 2020). This is further discussed by Villa Alvarez et al. (2022), whose research examines the design activities of PSI spaces and maps them to the policy making phases and stages defined by Howlett (2009). Their findings indicate that design is less present in the decision-making stage and in stages where formal decisions are made, such as: getting an issue on the formal agenda, consolidating a policy, legal-administrative processes, and policy feedback and termination. This may be because these stages are inherently political, conflictual and involve decisions made primarily by authorised decision-makers (e.g. elected representatives empowered to make binding public decisions). Unlike the initial traits that marked the concept of design for policy, its characteristics appear to be multifaceted, depending on how and where it is applied, by whom, and its implications for policy making. Kimbell et al. (2023) proposed a heuristic model to make sense of this complexity. The authors distinguished three propositions: the first relates to design as a "tool for policy making", where it supports the achievement of predefined policy goals; the second refers to design as a "practice of improvising within policy making", where it fosters adaptability and openness in response to unfolding policy challenges; the final proposition frames design as "regenerating policy making", where it enables a fundamental re-envisioning of policy making process itself. When applied to climate policy, these different propositions of design for policy take on a critical perspective. The scale and urgency of the climate crisis demand bold action, yet governments frequently exhibit risk aversion, opting for procedural strategies that mitigate political fallout rather than addressing the root causes of climate change (Howlett, 2014a). Design professionals and researchers who wish to contribute to realising the full potential of design in the context of climate policy should consider the characteristics of such a critical endeavour. To this end, the research applies Kimbell et al.'s heuristic to analyse climate policy through three dimensions: goals—linked to the first proposition, design as a tool for policymaking; challenges—corresponding to the second proposition, design as a practice of improvisation in policymaking; and processes—reflecting the third proposition, design as regenerating policymaking. In this regard, three research questions are derived to guide the analysis as illustrated in Figure 1.

Design for policy characteristics	Purpose of design	Example	Design outcome on public policy	Design for climate policy - Research questions
Design as a tool for policy making	to support achieving specified goals of policy making	Design toolkit	Supporting to solve specific goals	What are the goals of climate policy?
Design as a practice of improvising within policy-making	to enable policy-making to be more open in the face of unfolding events and experiences	Living labs	Enable policy making to tackle unfolding challenges	What are the main challenges of climate policy?
Design regenerating policymaking	to facilitate the re-envisioning of policy making	Creative futuring	Re-envisioning the process of policymaking	What defines the process of climate policy making?

Figure 1. The proposed analytical research framework, adapted by Kimbell et al. (2023)

This study provides a concrete analytical grounding that can inform future contributions within the broader field of design for policy, as well as among design practitioners seeking to address the climate crisis. First, the three focal areas—goals, challenges, and process—are investigated through an integrative literature review (Lubbe et al., 2020). Second, the findings are discussed considering Kimbell et al.'s heuristic model. Finally, the paper outlines key implications for design theory and practice.

2. Methodology

The production of literature on climate policy has proliferated in recent years (Boasson and Tatham, 2023). While this has advanced research across disciplines, it has also introduced significant complexity, particularly in identifying the key challenges of climate policy and climate policymaking. Given the aim of this study, which is to explore the potential contributions of design for policy by providing a structured analytical framework that situates the characteristics of this developing discipline within the context of climate policy, an integrative literature review was conducted. Specifically, this research adopts the integrative review methodology outlined by Lubbe et al. (2020), which is particularly suited to synthesising different forms of knowledge and developing theory in emerging fields. The review triangulated evidence from academic literature, national and international policy reports, discussion papers, and institutional documentation. Data sources included peer-reviewed databases such as Google Scholar, Scopus, and Web of Science. The following search terms were used in various combinations to capture relevant content: "policy design", "climate policy challenges", "climate policy goals", "policy-making process", and "design for policy". Literature selection followed an iterative

screening process based on relevance to extract information useful for providing a clear picture of climate policy goals, challenges and the policy-making process. Particular attention is paid to refining the classification of these three aspects under review. As Bailey (1994) noted, the lack of clear classification inhibits advanced conceptualisation and reasoning, which may be one of the obstacles in attempting to define the potential contribution of design for policy to climate policy. Classification, defined as the process of grouping entities based on shared characteristics, relies on the careful identification of key dimensions or variables. A poorly defined classification framework risks compromising analytical clarity and leading to ambiguous definitions of the specific relationship between design and climate policy. With this framework in mind, the following sections explore how design intersects with climate policy goals, challenges, and processes.

3. Climate policy: goals, challenges, and process

3.1. A complex phenomenon: climate crisis

The latest report from the Copernicus Institute claims that 2024 saw unprecedented global temperatures, marking the second consecutive year of record-breaking events after the exceptional 2023 (Copernicus Climate Change Service, 2024). Notably, 2024 was also the first year in which average temperatures exceeded 1.5°C above pre-industrial levels, the threshold set by the Paris Agreement to significantly reduce the risks and impacts of climate change. It was marked by the breaking of several global records, for greenhouse gas levels, air, and sea surface temperatures. These conditions contributed to extreme weather events, including floods, heatwaves and wildfires. Human activity, primarily through the emission of greenhouse gases, has been identified as the primary cause of global warming and its devastating and dramatic impacts (Calvin et al., 2023). Reversing the current climate crisis will require far-reaching and unprecedented changes in all sectors of society. This is because climate change is a complex phenomenon that links natural and built ecosystems with biodiversity, human societies with diverse forms of knowledge and values, cultures with traditions, and ecosystem health with human well-being and sustainable development. Actors involved in implementing climate change adaptation and mitigation measures operate at different spatial and institutional scales and represent different sectoral interests, which adds to the multifaceted nature of climate change (Ryan, 2015). Recently in Europe, there has been a shift in public sensibility towards recent European Commission initiatives on ecological transitions, such as the European Green Deal, highlighting the problem of the social desirability of this transition (Fondazione Symbola, 2024). Given this recent turmoil, it is inescapable that social, economic and political factors must be considered when identifying, designing and implementing solutions against climate change. This is true not only for policy, but also for science: the Global Sustainable Development Report (United Nations, 2023) advocates a transformation driven by and within science, recognising that scientific progress on climate change should also foster social innovation, and calls for scientists, policy-makers and diverse societal actors to work together at the science-policy-society interface, translating knowledge into policy and policy into effective climate action. The hybrid nature of climate interventions—spanning science, society, and policy—creates significant challenges in formulating and implementing effective climate policies, and in the definition of their goals (Sabel and Victor, 2024).

3.2 Climate policy goals

Climate policy refers to sectoral or overarching policies that lead to lasting reductions in emissions and adaptation to extreme environmental conditions because of rising global temperatures (Nascimento et al., 2022). Since it first emerged as a critical issue for global policymakers, climate policy has been largely synonymous with energy policy, mainly in terms of mitigation efforts and less so in terms of adaptation, as energy supply is dominated by fossil fuels, the main source of anthropogenic greenhouse gas emissions (Klein et al., 2005). It is only recently that climate policy has received significant attention in its two main components: mitigation and adaptation. It is noteworthy that these two components may exhibit a range of interactions, including competition, reinforcement, or even the overcoming of one by the other (Klein et al., 2007). Climate change mitigation is designed to minimise the extent of climate change and refer to anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases (IPCC, 2001). Whereas climate change adaptation is intended to minimise risks and seize upon new opportunities. It refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2001). The first two key goals of climate policy are therefore to control greenhouse gas concentrations in the atmosphere – the focus of mitigation measures – and to prepare for and reduce the adverse impacts of climate change while taking advantage of opportunities – the focus of adaptation interventions. Climate policy however should not only be concerned with the design of adaptative and mitigative interventions. A primary concern should also be to address development and equity issues, as policy implementation is intrinsically linked to socio-economic development (Fondazione Symbola, 2024). Failing to acknowledge this societal dimension might further decrease the chance to diffuse innovative approaches to tackle climate change (United Nations, New York, 2023). Finally, despite the centrality of mitigation and adaptation in the definition of climate policy itself, some authors have argued whether finding the perfect balance or mix of both measures should be the primary objective of climate policy. According to Klein et al. (2005), rather than directly implementing mitigation and adaptation measures, climate policy should facilitate their integration into sectoral policies (e.g., transport, trade, and energy). This perspective aligns with the broader recognition that climate policy cannot function in isolation (Tol, 2013). Instead, it must be an integral and complementary part of all relevant policies to ensure its relevance as climate conditions evolve and their consequences become more visible (Biesbroek et al., 2010). Lastly, the successful implementation of climate policy is closely linked to the extent to which governments can learn about mitigation and adaptation capacity at all levels of government and in all processes, and to create mechanisms and incentives for mainstreaming climate action (Tompkins and Adger, 2005; Berrang-Ford et al., 2014). If climate policy and sustainable development are to be achieved in an integrated manner, it is essential to explore the determinants of response capacity that shape policy options and their links to socio-economic and technological development pathways (Swart et al., 2003). The landscape of climate goals appears complex and multifaceted. Figure 2 summarises the five key goals derived from the literature review.

Climate Policy Goals	Description	Literature
Control atmospheric greenhouse gas concentrations.	Focus of mitigation; aims to reduce sources or enhance sinks of greenhouse gases.	IPCC (2001); Klein et al. (2005); Nascimento et al. (2022)
Prepare for and reduce adverse climate change impacts, and exploit emerging opportunities.	Focus of adaptation; adjusting systems in response to climatic stimuli to reduce harm or exploit benefits.	IPCC (2001); Klein et al. (2007); Nascimento et al. (2022)
Address development and equity issues.	Recognizes socio-economic factors as key to climate policy success and innovation diffusion.	United Nations, New York (2023); Fondazione Symbola (2024)
Facilitate development and implementation of mitigation and adaptation within sectoral policies.	Encourages integration into broader policy areas like transport, energy, and trade.	Klein et al. (2005); Biesbroek et al. (2010); Tol (2013)
Create mechanisms and incentives for mainstreaming climate action (responsive capacity building).	Emphasizes learning, capacity building, and policy integration at all levels of governance.	Swart et al. (2003); Tompkins and Adger (2005); Berrang-Ford et al., 2014;

Figure 2. Climate policy goals landscape

3.2 Climate policy challenges

Among the many challenges posed by climate policy, Berrang-Ford et al. (2014) identify good governance as a critical and central condition for enabling climate-resilient development through individual and collective action. This aspect emphasizes the necessity of coordinated efforts between governments, civil society, and the private sector to implement greenhouse gas mitigation and adaptation measures supporting sustainable development. However, coordination does not come effortlessly. Mitigation and adaptation operate at different scales—mitigation falls under international policies and is analysed through macroeconomic models, while adaptation takes the form of local, project-based activities with site-specific relevance, embedding a microeconomic perspective (Bosello et al., 2010). In addition, the identification of the actors involved or to-be-involved and their responsibilities remains ambiguous for both mitigation and adaptation. Klein et al. (2005) note that mitigation primarily involves the energy and transportation sectors in industrialized countries, as well as the energy and forestry sectors in developing nations, with the agriculture industry also playing a major role. These sectors are closely linked to national planning and policy making. Adaptation, on the other hand, encompasses a wider range of sectoral interests, including tourism, health, water supply, coastal management, urban planning and nature conservation, with decisions being taken from the micro level – such as by individual farmers – to the macro level – for example by national agencies. The characterisation of stakeholders engaged in climate policy can be approached through various lenses, including their organisational structure (e.g. public or private or a mixed combination), the level of decision-making involved (e.g. political, strategic planning or more operational implementation), the spatial scale (e.g. local, national, international or supranational), the time span of interest

(e.g. short to long term – particularly in the difference between mitigation and adaptation), and their function within a network (e.g. single actor, stakeholder regime or multi-actor constellations) (Klein et al., 2007). Differing perceptions of responsibility between actor groups and between different levels of governance further limit the implementation of effective responses to climate change adaptation (Mees et al., 2017; Ulibarri et al., 2022). For instance, although inclusive governance is regarded as a key condition for facilitating climate-resilient development, Petzold et al. (2023) study revealed that individuals and households—who implement nearly 64% of adaptation measures—are the least involved in co-designing responses with other actors (private sector, governments at various levels, academia, and civil society). This is a key concern, as the study by Biesbroek et al. (2010) and Mees et al. (2012) also emphasises that climate policy implementation cannot take place in isolation, but requires the coordinated efforts of public and private actors at all levels of government, making it a multi-level governance challenge. Finally, a persistent obstacle to adaptation and mitigation, despite the growing attention to climate change in policy and science, is the widespread lack of understanding of the climate problem and its potential impacts on daily life among the multitude of actors that characterise climate change issues (Lorenzoni and Pidgeon, 2006; Lorenzoni et al., 2007; Baiardi, 2022). Figure 3 synthesizes the four main challenges that emerged from the literature review.

Climate Policy Challenges	Description	Literature
Mitigation and adaptation measures can be mutually reinforcing or detrimental to each other.	Mitigation is global, long-term, and macroeconomic; adaptation is local, short-term, and microeconomic. Resource scarcity can cause friction between the two.	Klein et al. (2005); Klein et al. (2007); Bosello et al. (2010); IPCC (2023)
Actors involved operate at different spatial, temporal, and institutional scales with unclear roles and responsibilities.	Different sectors and governance levels are involved, with conflicting perceptions of responsibility and ambiguous mandates.	Klein et al. (2005); Klein et al. (2007); Mees et al. (2017); Ulibarri et al. (2022)
Implementation requires coordinated, multi-level governance.	Effective climate policy requires collaboration across public and private sectors and all levels of governance.	Berrang-Ford et al. (2014); Biesbroek et al. (2010); Mees et al. (2012); Petzold et al. (2023)
Lack of understanding of climate change and its impacts among diverse stakeholders.	Despite increased attention, many actors lack awareness of the relevance of climate change to their daily lives, which limits their engagement and commitment.	Lorenzoni and Pidgeon (2006); Lorenzoni et al. (2007); Baiardi (2022)

Figure 3. Climate policy challenges landscape

3.3 Climate policy process

Climate adaptation and mitigation strategies must be grounded in robust scientific evidence to be effective in addressing the climate crisis. The process of designing climate policy requires a careful translation of scientific data into actionable insights for policymakers. This translation process, in turn, depends on strong coordination and collaboration across scientific, policy, and societal actors. The latest IPCC report has

identified appropriate decision-making, coordination processes and structures as enabling conditions for responding to climate change effectively (IPCC, 2022). Furthermore, the systemic, long-term and cross-border nature of the climate crisis requires the flexibility to leverage multiple models of decision-making across different contexts and time. Integrated, agile, evidence-based and collaborative policy action is seen as a key attribute to increase political buy-in, avoid inertia and policy stagnation, and balance short- and long-term goals and needs (Kaur, M. et al., 2023). The nature of adaptation and mitigation decisions changes over time as climate might change in less unpredictable ways, also affecting the process of designing climate policy. For example, some decisions may have started with relatively simple measures, such as the adoption of low-cost supply and demand options in the energy sector, and evolved into complex intervention plans and strategies (see for instance the “Piano Clima” of the city of Rome in Italy, Comune di Roma, 2024). As previously discussed, the complex nature of climate change necessitates a thorough examination of climate science, systemic thinking, and multidisciplinary approaches. However, political actors might appear reluctant to implement policies that may lead to unpopular choices, which could potentially affect their chances of being re-elected. It has been observed that a significant discrepancy between the implications of climate science and the outcomes of climate policy can render current and planned policies inadequate in achieving the goals of the Paris Agreement (Meckling et al., 2015). The tension and struggle to produce practical outcomes for policymakers while maintaining legitimacy and scientific credibility further undermines the capacity of governments to address climate change (Niederberger, 2005; Sarewitz and Pielke, 2007). Translating scientific knowledge into a policy framework is not easy. The analysis conducted by Ryan and Bustos (2019) in Latin America highlighted how the fragmentation and lack of integration of the knowledge available on the different aspects of climate adaptation issues deeply affect their usability in policy processes. It appears that co-creation and collaborative modes of knowledge production in the field of climate adaptation do not tend to sustain over time. Climate change knowledge and co-production processes tend to be project based, fragmented, and linked to specific initiatives rather than to institutionalized long-term policy making or planning processes. Boundary organisations represent a key role in this regard, as they are specialised entities established to facilitate the dissemination of accessible scientific information in a more coherent manner (Gustafsson and Lidskog, 2018).

Jordan and Huitema (2014) adopt a more holistic approach to understanding the process of climate policy innovation, covering the source of new policy elements (‘invention’), their wider entry into use (‘diffusion’), and their projected and/ or real effects (‘evaluation’). Invention of policies happen mainly through the activities of “policy entrepreneurs”, who are politically relevant actors that are capable of overcoming process challenges such as shifting political agendas, political argumentation, capacity limitations, eventually finding new connections between politics and policy problems. Diffusion is defined as the process through which inventions circulate and potentially enter common use via learning, transfer, and adoption. Here, the primary issue is that information is poorly coordinated at the national and international level, with many different organisations contributing knowledge in an ad hoc fashion (Biesbroek et al., 2010). Finally, in the evaluation of new policies, a key challenge lies in defining the right metrics to assess their effectiveness. Traditional evaluations often focus on tangible outcomes, such as greenhouse gas emission reductions. However, this approach risks neglecting broader societal benefits that are equally important in assessing the overall impact of climate policies (Sudmant et al., 2024). In conclusion, five characteristics describing the climate policy-making process can be derived from the literature review and summarized in Figure 4.

Climate Policy Process' characteristics	Description	Literature
Duality of producing practical results while maintaining legitimacy and scientific credibility.	Tension between producing actionable policy and preserving scientific integrity; politicisation risks.	Niederberger (2005); Sarewitz and Pielke (2007); Meckling et al. (2015)
Lack of continuity in knowledge co-creation processes limits sustained policy-research relationships.	Knowledge creation tends to be fragmented and not embedded in long-term institutional frameworks.	Ryan and Bustos (2019); Gustafsson and Lidskog (2018)
Invention of new policies must navigate political dynamics and capacity limits.	Policy entrepreneurs must overcome agenda shifts, political resistance, and resource constraints.	Jordan and Huitema (2014)
Diffusion of climate information is poorly coordinated and often ad hoc .	Multiple actors produce and share knowledge in fragmented ways, limiting national-level coherence.	Biesbroek et al. (2010); Jordan and Huitema (2014)
Evaluation needs to go beyond GHG metrics to include societal impacts.	Effective evaluation must consider both environmental and social outcomes of climate policy.	Jordan and Huitema (2014); Sudmant et al. (2024)

Figure 4. Climate policy process landscape

4. Design for climate policy

In the public sector, policy and design activities are in constant dialogue. Public policy emerges from the efforts of governments to transform socio-technical systems. These systems are addressed either through direct intervention in the production, consumption and dismantling of products and services, or through indirect intervention in the internal processes of government that facilitate these creative processes. These efforts can be designed to a greater or lesser extent, and the goals and purposes sought to be achieved through such design are broad and varied (Howlett, 2014b). In design terms, policy defines the typologies of services and products, the relationships and interactions that are considered possible, encouraged or discouraged in each human system (Junginger, 2013). Therefore, in the context of the public sector, design is both the realisation and materialisation of policy as products and services and the formalisation of the policy-making process. Neither design nor policy can be considered in isolation. Design for policy is an emerging discipline that explores this intertwined relationship. Three distinct propositions of design for policy have been identified by Kimbell et al. (2023) to describe this relationship: design as a tool for policymaking; design as a practice of improvising within policymaking; and design regenerating policymaking. According to the authors, the outcome of the first proposition is to support the achievement of predefined policy goals; that of the second is to promote adaptability and openness in response to unfolding policy challenges; and finally, the outcome of the third proposition is to enable a fundamental rethinking of the policymaking process itself. These three outcome spaces, namely goals, challenges and process, were examined in the context of climate policy, as the aim of this study is to provide a concrete analytical basis to facilitate a better understanding of the contributions of design for policy to the climate crisis for both practitioners and researchers. Through an integrative literature review, each outcome space has been examined, and a set of characteristics has been identified.

4.1 Design as a tool for policymaking

The first proposition, 'Design as a tool for policy making', suggests that the contribution of design to policy is to support the achievement of specified policy goals and effective policy implementation (Kimbell et al., 2023). In this context, policy making is conceptualised as a distinct form of technical expertise operating within a defined worldview. The relationship between design and policy is characterised by the application of design to facilitate the generation and delivery of solutions to existing goals. For instance, in the study by Quilty et al. (2024), design is used as a powerful tool to deepen stakeholder understanding and stimulate new thinking in net zero projects at the district level. The authors developed a set of cards to be used in design ethnography workshops at Monash University in Victoria, Australia, as part of a project that combines design anthropology and transition management approaches to explore innovative pathways to net zero at the neighbourhood level. The result of the study shows how design artefacts might be a powerful tool for accelerating the implementation of existing climate policy goals, while also favouring a widespread understanding of climate change and its consequences. This example addresses one of the five climate policy goals that emerged from the integrative literature review: controlling atmospheric greenhouse gas concentrations. As illustrated in Figure 5, new research questions arise at the intersection between the initial proposition identified by Kimbell et al. (2023) and the climate policy goals identified. These involve defining strategies, interventions, products or services that could facilitate the creation of policies to effectively manage emissions, anticipate and respond to climate impacts, incorporate equity and development concerns, integrate adaptive and mitigative capacities into other policy domains, and establish mechanisms and incentives for the mainstreaming of climate action. Possible contributions of design to climate policy could include setting a shared vision of possible adaptive and mitigative futures for human and non-human actors; opening up climate policymaking to groups at risk of exclusion and marginalisation due to climate change; designing instruments and tools that integrate climate actions across policy domains; and embedding design techniques and methodologies to create engaging climate action capacity-building efforts at different government levels.

Kimbell's et al. (2023) proposition	Climate Policy Goals	Design for climate policy RQ	Expected contributions of "Design as a tool for climate policy making"
Design as a tool for policy making	Control atmospheric greenhouse gas concentrations.	How does design contribute to the definition of policies that can control atmospheric greenhouse gas concentrations?	<i>Set a shared vision and imagination on possible mitigative and adaptive futures for human and non-human actors.</i>
	Prepare for and reduce adverse climate change impacts, and the exploitation of emerging opportunities.	To what extent can design prepare for and mitigate the adverse effects of climate change and take advantage of the opportunities it offers through policy-making?	
	Address development and equity issues.	How could design address development and equity issues in climate policy?;	<i>Open up the field of climate policymaking to groups at risk of exclusion and marginalisation due to climate change.</i>
	Facilitate the development and implementation of specific mitigation and adaptation options as part of sectoral policies (e.g. transport, trade, energy, etc.).	How could design facilitate developing and implementing specific mitigation and adaptation options within sectoral policies (e.g. transport, trade, energy, etc.)?	<i>Design of instruments and tools to facilitate the integration of climate actions across other policy domains.</i>
	Create mechanisms and incentives for mainstreaming climate action across all governmental levels and processes (responsive capacity building).	How does design create mechanisms and incentives for the mainstreaming of climate change into all levels and processes of government (responsive capacity building)?	<i>Include design techniques and methodologies to create engaging and compelling climate action capacity-building efforts at different government levels.</i>

Figure 5. Design as a tool for climate policy's RQ and expected contributions

4.2 Design as a practice of improvising within policy making

The second proposition identified by Kimbell et al. (2023) describes 'design as a practice of improvisation within policy making'. In this context, design enables policy making to be more improvisational and experimental in the face of complexity and uncertainty. Policy making is understood as a responsive process in which policy must necessarily negotiate between different worldviews (e.g. different stakeholder interests). Design and policy interact here in such a way that design is used to modify and extend existing policy, based on engagement with lived experience and diverse positions and expertise, thereby bridging the gap between policy and implementation. In Salinas (2022), "world-building preferable futures through critical service design" are introduced as a participatory approach to local policy design. The context of application is the Climate Studio initiative at the University of the Arts London (UAL), which brings together citizens, organizations, and government actors to engage in collaborative, place-based climate action. Through workshops and scenario-building exercises, participants co-created policy challenges and solutions, challenging traditional linear policy processes and fostering multi-stakeholder alignment. This example addresses one of the four climate challenges that emerged from the integrative literature review: the complexity of multi-level governance models. Figure 6 summarises the findings of the review and suggests research questions

for practitioners and academics. In this context, design for policy should address the antagonistic and interdependent mitigation-adaptation relationship. Furthermore, integrating different interests across multiple spatial, temporal, and institutional scales should be emphasised as a critical aspect of research. This should not overlook the need to design multi-level governance models or the difficulty of mobilising and sustaining public interest in relation to climate change. Design could contribute to climate policy-making challenges by enabling the integration of systemic design practices to bridge the gap between mitigation and adaptation actions, facilitating the development of a shared language and common understanding of the roles and responsibilities of various stakeholders, enabling cross-collaboration through participatory design that activate multilevel, multi stakeholder governance models, and fostering knowledge transfer between the scientific community and non-scientific recipients in climate policy-making.

Kimbell's et al. (2023) proposition	Climate Policy Challenges	Design for climate policy RQ	Expected contributions of "Design as a practice of improvising" within climate policy making
Design as a practice of improvising within policy making	Mitigation and adaptation measures can be mutually reinforcing or detrimental to each other.	How can design-led approaches facilitate the integration of mitigation and adaptation policies at global and local scales, ensuring coherence between long-term strategic goals and short-term, context-specific actions?	<i>Enable the integration of systemic design practices in policymaking to bridge the gap between mitigation and adaptation actions.</i>
	Actors involved operate at different spatial, temporal, and institutional scales with unclear roles and responsibilities.	How can design help clarify the roles, responsibilities and expectations of different actors operating at different spatial, temporal and institutional levels in climate policy?	<i>Facilitate the development of a shared language and a common understanding of the roles and responsibilities of the various stakeholders involved in climate policy-making.</i>
	Implementation requires coordinated, multi-level governance.	Which design process can support the coordination and alignment of public and private actors to promote a multi-level climate governance model?	<i>Enable cross-collaborative innovation through participatory design that activate multilevel and multistakeholder governance in climate policymaking.</i>
	Lack of understanding of climate change and its impacts among diverse stakeholders.	How can design for policy enhance public understanding of climate change by translating abstract scientific knowledge into tangible narratives that resonate with everyday experiences and motivate sustained engagement?	<i>Facilitate knowledge transfer between the scientific community and non-scientific stakeholders involved in climate policy.</i>

Figure 6. Design as a practice of improvising within climate policy making's RQ and expected contributions

4.3 Design regenerating policy making

Finally, the third proposition, defined by Kimbell et al. (2023) as 'design regenerates policy making', appears to be the most ambiguous and multifaceted type of relationship between design and policy. Within this third proposition, the purpose of design is to challenge or unsettle assumptions embedded in policy making and enable revitalisation of stalled policy processes. Here, policy making is understood as a generative or even agonistic space where policy emerges from the decentring of different worldviews.

Design and policy thus interact here in such a way that design is used to re-imagine the basis for policy making, challenging the way policy issues are framed, and policies are designed and implemented. Lähteenoja et al. (2023) illustrate how design can contribute to reinventing policy making at the strategic level to shape innovative national sustainable strategies. The authors examined the dynamics of co-design in the formulation of a national sustainable development strategy in Finland. The study highlights the instrumental, attitudinal and intellectual contributions of design to policy formulation, complementing sustainable transition expertise with design methodologies. This study exemplifies how design can innovate policy-making processes. As Kimbell et al. (2023) have highlighted, this is the most recent and complex use of design in policymaking, perhaps because it touches on complex political issues and strategic decision-making processes, challenging the status quo of how policy is designed. In this regard, the findings of the literature review pose new questions for design practitioners and researchers, as summarized in Figure 7. These focus on balancing science and politics in design for climate policy, and on fostering co-creative processes that are institutionalised and sustained over time to avoid incoherence. Furthermore, new research should explore ways to facilitate the development of a new generation of climate policies that can navigate evolving political agendas with a forward-looking approach. It is also critical to explore both the vertical diffusion of climate knowledge within a country and the horizontal diffusion across nations, as well as considering other metrics and measurement approaches beyond GHG emissions to understand the impact of climate policy. A set of suggested design contributions include: the creation of boundary objects, spaces, and experiences to allow interconnection between science and politics in climate policymaking; redesigning the policy cycle to permanently embed knowledge co-production processes on climate change issues; embedding speculative design and future foresight in the innovation process to create a more forward-thinking approach; democratising access to scientific knowledge that is understandable and relatable to increase awareness and participation in climate policymaking; and extending the current measurement approach in climate policymaking by introducing new human- and planet-centred metrics.

Kimbell's et al. (2023) proposition	Climate Policy Process	Design for climate policy RQ	Expected contributions of "Design regenerates climate policy making"
Design regenerating policymaking	Duality of producing practical results while maintaining legitimacy and scientific credibility.	How can design for policy mediate between scientific knowledge and political decision-making to ensure both practical relevance and scientific legitimacy in the development of climate adaptation and mitigation strategies?	<i>Design boundary objects, spaces and experiences to allow for interconnection between science and politics in climate policymaking.</i>
	Lack of continuity in knowledge co-creation processes limits sustained policy-research relationships.	What design strategies can support the institutionalization of co-production practices in climate policy, moving beyond one-off projects toward embedded, long-term participatory governance?	<i>Redesign the policy cycle for climate policymaking to embed knowledge co-production processes on climate change issues on a permanent basis.</i>
	Invention of new policies must navigate political dynamics and capacity limits.	In what ways can speculative and future-oriented design practices support the invention of adaptive climate policies that remain resilient in the face of shifting political agendas and institutional capacity limitations?	<i>Embed speculative design and future foresight in the innovation process of climate policymaking to create a more forward-thinking approach.</i>
	Diffusion of climate information is poorly coordinated and often ad hoc.	How can design-led visualization and communication tools be employed to improve the coherence and accessibility of climate knowledge across national policy networks and organizational boundaries?	<i>Democratize the access to scientific knowledge that is understandable and relatable in order to increase awareness and participation in climate policy-making</i>
	Evaluation needs to go beyond GHG metrics to include societal impacts.	What role can design play in developing new frameworks and indicators for evaluating climate policies that account for both quantitative outcomes (e.g., GHG reductions) and qualitative societal benefits?	<i>Extend the current measurement approach in climate policymaking by introducing new human and planet centred metrics</i>

Figure 7. Design regenerating climate climate policy making's RQ and expected contributions

5. Conclusions

Climate change can be understood as a particularly complex form of a "wicked problem," as defined by Rittel and Webber (1973). Its causes are diffuse and deeply rooted, while its impacts span social, economic, and environmental domains. Design has long been recognized as a promising approach for addressing such multifaceted challenges (Buchanan, 1992). The recent expansion of design into the realm of public policy – referred to as "design for policy" (Bason, 2014) – raises important and urgent questions about the intersection of design, policy, and climate change. This research offered a structured analytical framework that situates design for policy within the critical and highly political domain of climate policymaking. Three key areas are considered: climate policy goals, challenges and process. These are derived from the heuristic developed by Kimbell et al.

(2023). The model describes the relation between policy and design through three propositions: (1) design as a tool for policy making, where design supports achieving specified policy goals; (2) design as a practice of improvising within policy making, where design fosters diversity and openness in response to unfolding policy challenges; and (3) design regenerating policy making, where design facilitates a fundamental re-envisioning of the policy-making process. Through an integrative literature review, climate policy goals, challenges, and process are scrutinized and a set of implications for design for climate policy are derived. The first cluster—goals—suggests that design should contribute to the development of strategies, interventions, and services that help reduce emissions, design adaptation to extreme events, address equity and development concerns, and integrate adaptive and mitigative efforts across policy domains. The second—challenges—highlights the need for design to address the interdependence and often conflictual relationship between mitigation and adaptation, support multi-level governance models, and foster broader public engagement across spatial, temporal, and institutional scales. The third—process—underscores the importance of balancing scientific legitimacy with political feasibility, sustaining knowledge co-production processes between experts and policymakers, and identifying new indicators for climate policy that can capture the complexity of climate interventions. Design should enable institutionalized knowledge co-production processes, support the emergence and diffusion of systemic and future-oriented policy innovations, and contribute to developing evaluation frameworks that go beyond GHG metrics to also include societal impacts.

While this study offers a conceptual contribution by mapping climate policy characteristics against Kimbell et al.'s heuristic (2023), it remains theoretical in nature, relying exclusively on literature rather than empirical data. The lack of case study validation limits the ability to assess how design operates in real-world climate policy contexts. Moreover, the integrative review, while broad in scope, may have overlooked relevant grey literature or emerging local initiatives not captured in major academic databases. The categorization into three clusters – goals, challenges, and process – serves as a useful analytical device, but inevitably simplifies the complexity and interdependence of climate policy issues. Finally, a more thorough investigation of the suggested design contributions for climate policy is needed to reflect both on the positive and negative impacts that the application of design thinking may have in this context. Future research should empirically test and refine this framework through participatory design methods and comparative analyses across geographical and governance contexts. This will help build a more robust foundation for the theory and practice of design for climate policy. Ultimately, this paper lays the groundwork for future collaborations between design practitioners and climate policy experts, as further research will enable a more practical and contextual understanding of design's role in this critical domain of public policy making.

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exhibition**

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Xavier Drouaud
Flavien Conilleau

Maxime Zoffoli
Jean-Luc Barassard
Béranger Recoules
Suânly Pinson
Neil Carmichael
Claire Camisoli
Alix Berthelot
Victor Petit-Petit
Nicolas Poiroux

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Federico Casalegno
Gjoko Muratovski
Fabien Grégoire
Rohit Priyadarshi Sanatani
Antoinette Lemens
Sihem BenMahmoud-Jouini
Matthieu Aquino
Stéphanie Roland
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Clara Bove
Katie Cotellon
Nicolas Buche
Emmanuel Thouan
Srini Srinivasan
Joesph Press
Jerome Ferrari Fromager
Georgios-Alexandros Tsaltas
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