Ecological Civilization

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Review

From Research to Regulation: Linking Scientific Evidence and European Climate Policy for Human Well-Being

Andreea Nita *

Centre for Environmental Research and Impact Studies (CCMESI), Faculty of Geography, University of Bucharest, 010041 Bucharest, Romania

* Corresponding author. E-mail: andreea.nita@unibuc.ro (A.N.)

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ABSTRACT: Understanding whether and how scientific knowledge on the benefits of climate action for people actually reaches the regulatory level is essential for designing policies that last. The largest contribution of climate policy to human well-being is climate protection itself, through the harms it averts; the social and health dimensions examined here constitute the complementary design layer that conditions the feasibility, fairness and durability of that protection. In this study, we examine the connection between the scientific literature on climate action and human well-being and the climate policy framework developed by the European Union between 2019 and 2024. This approach combines two components. First, we performed a bibliometric analysis of 1499 Scopus-indexed articles and reviews published between 2020 and 2025 that address climate action and human well-being in an explicit policy context. Scientific production more than tripled over this period, growing from 134 documents in 2020 to 441 in 2025, and the keyword co-occurrence network resolves the field into four thematic clusters: just transition, energy poverty and climate justice; adaptation, nature-based solutions and well-being; mitigation co-benefits and air quality; and sustainable development goals and cross-sectoral policy. Second, we compiled and analyzed a corpus of 25 key EU policy documents, from the European Green Deal to the recast Energy Performance of Buildings Directive, coding each instrument at the level of its substantive provisions against six well-being dimensions: health, energy poverty and affordability, employment and just transition, equity, participation, and quality of life. A qualitative reading of the operative provisions of four binding instruments complements the coding. To connect the policy analysis with the current state of the science, we further reviewed 25 syntheses published in 2023–2025, 21 drawn from the corpus and four institutional assessments, and modelled syntheses, well-being dimensions and policy documents as an evidence-policy correspondence network. These results indicate an uneven but deepening incorporation of well-being concerns into EU climate law. Just transition and energy poverty provisions, which anchor the largest cluster of the recent literature, have progressively migrated from strategic documents into legally binding instruments, most visibly through the Social Climate Fund and the revised emissions trading framework. In contrast, health co-benefits, although central to one of the most consolidated research clusters, remain concentrated in soft-law strategies and are rarely operationalized in binding law. The network quantifies this asymmetry: health is the dimension most frequently addressed by the recent syntheses but the least coupled to binding instruments, whereas employment and just transition show the strongest coupling. We also examine why climate policy may fail to improve well-being and show that adaptation, which has

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overtaken mitigation as the most frequent keyword of the corpus and concentrates the well-being vocabulary of the field, remains the least binding component of the EU framework. We argue that the EU framework represents a case of partial translation of scientific evidence into regulation, and we discuss pathways through which enduring climate action can be more explicitly designed as well-being policy. The findings support the broader perspective of an ecological civilization, in which climate governance and quality of life are addressed as complementary rather than competing objectives.

Keywords: Climate action; Human well-being; Quality of life; Bibliometric analysis; European Green Deal; Climate policy; Science-policy interface; Just transition

1. Introduction

The relationship between climate action and human well-being has become a central topic of both climate research and climate politics. The Sixth Assessment Report of the Intergovernmental Panel on Climate Change explicitly frames climate-resilient development in terms of well-being outcomes and shows that ambitious mitigation and adaptation can be designed to improve health, livelihoods and equity, not only to reduce emissions [1,2]. In this context, a growing body of research demonstrates that decent living standards for all are compatible with deep decarbonization [3,4], that demand-side mitigation options can maintain or even improve well-being [5], and that the health co-benefits of climate policy are substantial, near-term and unequally distributed [6–10].

A conceptual clarification is warranted at the outset. The largest contribution of climate policy to human well-being is, and will remain, climate protection itself: the heat-related mortality, food and water insecurity, displacement, conflict risk and economic damage that ambitious mitigation averts dwarf, in welfare terms, any accompanying social measure [1], a dynamic already visible in climate-stressed regions such as the Sahel, where climate and human impacts compound each other faster than international policies respond [11]. This primacy is increasingly recognized in legal terms as well, as constitutional and human-rights jurisprudence has begun to treat effective climate protection as a matter of fundamental rights, with direct implications for the adequacy of EU climate law [12]. The co-benefits, distributional safeguards and procedural provisions examined in this study are therefore complements to, not substitutes for, mitigation ambition. They matter precisely because they condition the social feasibility, legitimacy and durability of the protection effort: climate policies perceived as unfair or harmful to vulnerable groups are politically fragile, and their reversal would forfeit the primary well-being gains of protection itself [13]. It is this complementary design layer, how the social and health dimensions of well-being are built into climate regulation, that this analysis addresses, nevertheless, this method cannot assess the climate effectiveness of the instruments themselves.

Within this design layer, the literature warns that climate policies are not automatically beneficial for well-being. If designed without attention to equity, mitigation instruments can generate regressive distributional effects, energy poverty and localized employment losses [14–16], while climate change itself amplifies existing inequalities within and between countries [17,18], and the very framing of this climate-poverty nexus in the discourse of international institutions is itself contested [19]. It is therefore not surprising that the concept of just transition has evolved, in about a decade, from a trade union demand into a central category of climate governance research and critique [20–22]. Whether this accumulating evidence is absorbed by regulators is a classic question of the science-policy interface: knowledge is more likely to be used when it is perceived as credible, salient and legitimate [23], yet well-documented barriers continue to limit the uptake of research results by policymakers [24,25].

The European Union provides a particularly relevant setting for examining this translation process. Since 2019, the EU has adopted the most comprehensive package of climate legislation of any major jurisdiction, anchored in the European Green Deal [26] and in the legally binding climate neutrality objective of the European Climate Law [27]. The Fit for 55 package, the new Adaptation Strategy [28] and a series of accompanying instruments have progressively introduced explicitly social provisions, culminating in a dedicated Social Climate Fund designed to protect vulnerable households, micro-enterprises and transport users from the distributional effects of carbon pricing [29]. The evolution of this policy mix has been analyzed mainly from governance and political science perspectives [30–32]. However, to the best of our knowledge, a systematic assessment of the degree to which the well-being dimensions emphasized by the scientific literature are embedded in the policy corpus itself is still missing.

This study aims to fill this gap by answering three research questions. First, what is the structure and dynamics of the recent scientific literature linking climate action to human well-being in a policy context, and what do its most recent syntheses conclude? Second, which well-being dimensions are incorporated in the EU climate policy corpus adopted between 2019 and 2024, in which types of instruments, and through which concrete provisions? Third, where do the thematic priorities of science and the substantive provisions of regulation converge or diverge, and what does this imply for the design of enduring climate action? To answer these questions, we combined bibliometric science mapping [33], a structured review of the most recent syntheses of the field, and a structured content analysis of policy documents, connected through an evidence-policy correspondence network, following an integrated framework in which scientific evidence, regulation, and well-being outcomes are connected through the science-policy interface (Figure 1). By doing so, we contribute to the emerging research agenda of ecological civilization, treating climate governance and quality of life as jointly produced outcomes of the same institutional architecture, and we respond directly to the call of this Topic to document the contributions of enduring climate action to social well-being.

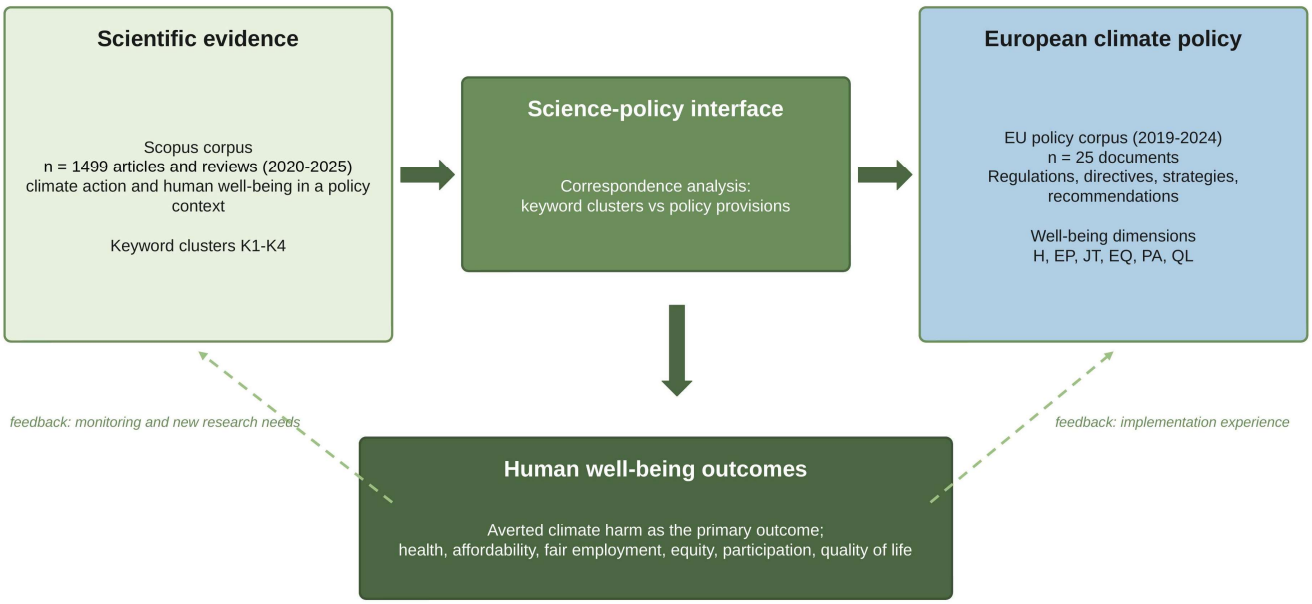


Figure 1. Conceptual framework of the study. The bibliometric corpus (left) and the EU climate policy corpus (right) are analyzed independently and then confronted at the science-policy interface; both are evaluated against human well-being outcomes, with averted climate harm as the primary outcome and six complementary dimensions (health, H; energy poverty and affordability, EP; employment and just transition, JT; equity, EQ; participation, PA; quality of life and living environment, QL). Solid arrows indicate the analytical flow from scientific evidence through the science-policy interface to European climate policy and to human well-being outcomes; dashed arrows represent feedback from implementation and monitoring to research.

2. Materials and Methods

2.1. Bibliometric Analysis of the Climate Action and Well-Being Literature

For the bibliometric component, we followed established guidelines for science mapping [33]. We retrieved records from Scopus on 9 October 2026, using a three-block search strategy applied to titles, abstracts and keywords: (i) climate action terms ("climate action" OR "climate policy" OR "climate governance" OR "climate mitigation" OR "climate change mitigation" OR "climate adaptation" OR "climate change adaptation" OR "climate legislation" OR "climate law"); (ii) well-being terms ("human well-being" OR "human wellbeing" OR "wellbeing" OR "well-being" OR "quality of life" OR "social welfare" OR "co-benefits" OR "just transition" OR "energy poverty"); and (iii) policy terms ("policy" OR "policies" OR "governance" OR "regulation" OR "legislation" OR "european union" OR "decision making"). The third block restricts the corpus to publications that treat the climate action and well-being relationship in an explicit policy, governance, or regulatory context, in line with the objective of the study. The search covered 2020–2025, a period that matches the European Green Deal legislative cycle analyzed in the policy component, and retrieved 1949 records. After an analytical screening that restricted the corpus to English-language articles and reviews, with duplicates checked using Scopus identifiers, the final corpus comprised 1499 documents (1255 articles and 244 reviews). The full search string, the corpus, and all bibliographic fields are provided as Supplementary Database S1. We opted for a single-database design, as Scopus offers wide coverage of the environmental social sciences and a single source avoids the inconsistencies introduced by cross-database record matching; the implications of this choice are discussed in Section 4.4.

We computed performance indicators (annual scientific production, most productive sources and countries, most cited documents, international co-authorship) directly from the export, using Python (version 3.13) with the pandas library (version 3.0). For science mapping, we followed the co-word analysis tradition established by dedicated bibliometric tools [34,35]: author keywords were harmonized by merging singular and plural forms and spelling variants (for example, just transitions into just transition, wellbeing into well-being), the generic terms climate change and global warming were removed, and a co-occurrence network of the 45 most frequent keywords was constructed with NetworkX (version 3.7). Thematic clusters were identified through Louvain community detection (resolution 1.1, fixed seed for reproducibility). In parallel, we assembled an author-curated seed corpus of 42 key publications, classified into seven conceptual clusters, which we used to anchor the interpretation and labelling of the empirically derived keyword communities, an approach we previously applied in the bibliometric analysis of impact assessment scholarship [36]. The seed corpus and the classification are reported in Supplementary Database S1.

Two clarifications on the clustering procedure are warranted. Louvain community detection and the clustering routine implemented in VOSviewer belong to the same family of methods: both optimize a modularity-type quality function with a resolution parameter, and they differ in the optimization algorithm and in the default normalization of co-occurrence weights [37,38]. We used the NetworkX implementation because it allowed harmonization, network construction, and clustering to run in a single scripted workflow, but the result is not tied to it: Supplementary Database S1 now provides the harmonized keyword frequencies, the complete weighted edge list, and a VOSviewer-compatible map and network file (Supplementary Table S6), so that the network can be opened and re-clustered directly in VOSviewer. We also tested the stability of the solution by repeating the Louvain procedure over 20 random seeds at resolutions between 0.8 and 1.5 and by applying the greedy modularity algorithm. The three substantive clusters (just transition, energy poverty and climate justice; adaptation, nature-based solutions and well-being; mitigation co-benefits and air quality) are recovered at every resolution between 1.0 and 1.4 and by the alternative algorithm, whereas the sustainable development goals cluster (K4) is a boundary community whose members are absorbed by the neighbouring clusters at lower resolutions. We therefore interpret K4

as a framing layer rather than as a distinct research front (Section 3.1). The modularity of the four-cluster solution is 0.22, a value typical of dense co-word networks in which the most frequent keywords co-occur across all communities.

2.2. The EU Climate Policy Corpus and Well-Being Coding

For the policy component, we compiled a corpus of 25 EU-level climate policy documents adopted or published between December 2019 and 2024, using EUR-Lex and the European Commission policy repositories (Supplementary Database S2). The corpus includes the framing strategies of the European Green Deal cycle (among them the Green Deal Communication, the Adaptation Strategy, the Renovation Wave, the Zero Pollution Action Plan and the Fit for 55 framing communication) and the principal legally binding instruments of the 2019–2024 legislature (including the European Climate Law, the revised Emissions Trading Directive and its extension to buildings and road transport, the Effort Sharing and LULUCF Regulations, the revised Renewable Energy, Energy Efficiency and Energy Performance of Buildings Directives, the Carbon Border Adjustment Mechanism, the Just Transition Fund, the Social Climate Fund, the Nature Restoration Regulation and the Net-Zero Industry Act). We applied three selection criteria: (i) EU-level provenance; (ii) formal adoption or official publication; (iii) climate mitigation, adaptation or climate-relevant sectoral scope.

We coded each document for the presence of substantive provisions or objectives on six well-being dimensions derived from the literature reviewed in Section 1: health (H), energy poverty and affordability (EP), employment and just transition (JT), equity and distributional fairness (EQ), participation and procedural dimensions (PA), and quality of life and living environment (QL). Two clarifications are important. First, the unit of analysis is the substantive provision, not the frequency of terms: a dimension was coded as present only where the stated objectives, recitals or operative provisions of the instrument, as published on EUR-Lex, contain identifiable commitments, mechanisms or obligations relating to it, so the coding does not reduce to counting how often words are mentioned. Second, the coding characterizes how well-being dimensions are incorporated in the design of the instruments; it does not measure the instruments' contribution to climate protection, which is a different analytical question requiring emissions and carbon budget metrics. Coding followed a binary presence/absence protocol at document level and was performed by the author; the full coding scheme, operational definitions, and document-level codes are reported in Supplementary Database S2. In addition, we classified documents by instrument type (regulation, directive, decision, communication, recommendation) and legal bindingness, allowing us to distinguish between the rhetorical incorporation of well-being in strategic documents and its operationalization in enforceable law. To complement the structured coding, we undertook a qualitative reading of the operative provisions of four binding instruments central to the social dimension of the framework (the European Climate Law, the revised Emissions Trading Directive, the Social Climate Fund Regulation and the recast Energy Performance of Buildings Directive), reported in Section 3.4.

2.3. Linking Scientific Evidence and Policy Provisions

In the third analytical step, we confronted the two corpora. We mapped the empirically derived keyword clusters of the literature against the six well-being dimensions of the policy coding, generating a correspondence that identifies (i) themes in which scientific attention is matched by binding policy provisions, (ii) themes reflected only in soft-law strategies, and (iii) themes for which no substantive regulatory counterpart could be identified. This qualitative confrontation does not assume a linear model of knowledge transfer; consistent with interactional accounts of the science-policy interface [23], we treat the co-evolution of research agendas and policy frameworks as the object of description. This cluster-level confrontation, however, describes the evolved landscape of the field rather than what its most recent

research concludes. To connect the policy analysis with the current state of the science, we therefore added two steps.

First, we undertook a structured review of recent syntheses. From the 158 reviews published in 2023–2025 in the corpus, we selected the 21 that synthesize evidence on at least one of the six well-being dimensions in a policy context, giving priority to the most cited and to those with a European or EU-level scope. We complemented them with four institutional assessments that a European policy audience would expect to see summarized: the IPCC Synthesis Report [39], the 2024 report of the Lancet Countdown [40], the European Climate Risk Assessment [41] and the first progress assessment of the European Scientific Advisory Board on Climate Change [42]. Each of the 25 syntheses was coded against the six well-being dimensions based on its stated scope and conclusions, following the same presence/absence protocol applied to the policy corpus (Table 1). Second, we modelled syntheses, well-being dimensions and policy documents as a tripartite network, an approach we have applied before to environmental governance and EU climate policy [43,44]: a synthesis is linked to every dimension it addresses, and a policy document is linked to every dimension on which it contains substantive provisions. For each dimension, we computed an evidence-policy coupling index, defined as the share of the dimension in the links of binding instruments divided by its share in the links of recent syntheses. Values above 1 indicate that binding law engages the dimension more than the recent evidence base would predict, and values below 1 indicate that the evidence has outrun regulation. The coding of the syntheses, the network edge lists and the coupling indicators are reported in Supplementary Database S1 (Key_Syntheses sheet) and Supplementary Table S7.

Table 1. Recent syntheses (2023–2025) used to characterize the state of the art, their main message for a policy audience and the well-being dimensions they address (H, health; EP, energy poverty and affordability; JT, employment and just transition; EQ, equity and distributional fairness; PA, participation and procedural dimensions; QL, quality of life and living environment). S1 to S21 are reviews from the Scopus corpus; S22 to S25 are institutional assessments. Full references and coding are in Supplementary Database S1 (Key_Syntheses sheet).

ID	Synthesis	Main Message for a Policy Audience	Dimensions
S1	Schaeffer et al. 2025, One Earth [45]	Annual cross-disciplinary synthesis; stresses the limits of adaptation under compounding extremes and the need to embed justice, governance, and just transition considerations in accelerated mitigation	H, JT, EQ, PA
S2	Dupont et al. 2024, WIREs Climate Change [46]	Three decades of EU climate policy show progressive institutionalization and politicization; the climate neutrality framework is consolidated, but implementation, fairness and public support remain contested	JT, EQ, PA
S3	Tonne et al. 2025, The Lancet Planetary Health [47]	European mitigation pathways deliver measurable health gains through cleaner air, healthier diets and active mobility; health should be an explicit objective, not a by-product, of EU climate policy	H, EQ, QL
S4	Moutet et al. 2025, The Lancet Planetary Health [48]	Systematic review: net-zero consistent strategies in energy, transport, food and buildings generate substantial public health co-benefits, mostly through air quality, diet and physical activity	H, QL
S5	Cuevas et al. 2024, Climate Policy [49]	Carbon pricing yields health co-benefits through reduced air pollution but can be regressive; revenue recycling and protection of vulnerable households condition both the health and the equity outcome	H, EP, EQ
S6	Finn and Brockway 2023, Energy Research and Social Science [50]	Energy demand reduction in Europe produces a wide set of co-benefits beyond health, including affordability, employment, comfort and energy security	H, EP, JT, QL
S7	Dwarkasing 2023, Energy Research and Social Science [51]	Low-carbon transition policies produce unequal social outcomes that are mediated by pre-existing inequality; justice impacts must be anticipated in policy design rather than corrected afterward	EP, JT, EQ

S8	van Bommel and Höffken 2023, Environmental Innovation and Societal Transitions [52]	The urgency of climate action and the pursuit of justice in energy transitions are in tension; procedural justice and inclusion are conditions for legitimate acceleration	JT, EQ, PA
S9	Betts-Davies et al. 2024, Energy Research and Social Science [53]	Economic narratives of mitigation differ in whether and how they pursue inequality reduction; redistribution mechanisms are not interchangeable and have different well-being implications	EP, EQ
S10	von Malmborg 2024, Sustainability [54]	Policy entrepreneurs shaped the just transition agenda in EU climate neutrality policy; ideology and democratic process condition which version of just transition is institutionalized	JT, PA
S11	Fujihara et al. 2025, Energies [55]	Energy poverty is multidimensional; predictive and monitoring frameworks need affordability, housing quality, and vulnerability indicators to target policy	EP, EQ
S12	Mastrucci et al. 2023, Annual Review of Environment and Resources [56]	Low energy demand futures for buildings are compatible with decent living standards; sufficiency and efficiency can cut demand while maintaining or improving well-being	EP, QL
S13	Blackburn et al. 2024, WIREs Climate Change [57]	Low-consumption lifestyles can reduce emissions with neutral to positive effects on subjective well-being, although the evidence base remains thin	QL
S14	Maduta et al. 2023, Energy and Buildings [58]	Implementation of the Energy Performance of Buildings Directive is uneven across Member States; renovation of worst-performing buildings is decisive for both neutrality and affordability	EP, QL
S15	Herath and Bai 2024, Sustainability Science [59]	Urban green infrastructure delivers health, climate and social co-benefits; equity of access and maintenance are emerging themes	H, EQ, QL
S16	Aghaloo et al. 2024, Urban Forestry and Urban Greening [60]	Nature-based solutions enhance urban flood resilience and provide health, biodiversity and amenity co-benefits	H, QL
S17	Sharifi 2023, Sustainable Cities and Society [61]	Urban resilience requires integrating social, ecological and technological systems, with explicit attention to justice, participation and trade-offs	EQ, PA, QL
S18	Jurgilevich et al. 2023, Environment International [62]	Vulnerability to climate-related health impacts in cities depends on social, built-environment, and institutional factors that adaptation policy can address	H, EQ
S19	Rafa et al. 2025, People and Nature [63]	Place-based environmental distress (solastalgia) is an emerging mental health outcome of environmental change that current policy does not address	H, QL
S20	Stein et al. 2024, The Lancet Planetary Health [64]	Disability-inclusive climate action is a condition for climate justice and climate-resilient development; persons with disabilities are largely absent from climate policy	H, EQ, PA
S21	Zavala et al. 2024, International Journal of Environmental Research and Public Health [65]	Health impacts of climate change are gendered; adaptation and health policy need gender-responsive design	H, EQ
S22	IPCC 2023, IPCC, Geneva [39]	Climate-resilient development integrates adaptation and mitigation with equity and justice and improves well-being; the window for such pathways is closing rapidly.	H, JT, EQ, PA, QL
S23	Romanello et al. 2024, The Lancet [40]	Health threats from climate change reached record levels; delayed action increases health costs, while health-centred mitigation delivers immediate co-benefits	H, EQ
S24	EEA 2024, EEA Report 01/2024, Copenhagen [41]	Europe is the fastest-warming continent; several climate risks to health, food, ecosystems and social cohesion are already at critical levels and adaptation policy lags behind.	H, EQ, QL

S25	ESABCC 2024, ESABCC, Copenhagen [42]	EU progress toward 2030 and 2040 targets is insufficient in several sectors; recommendations include ensuring a fair transition, addressing energy poverty and strengthening governance and participation.	EP, JT, EQ, PA

3. Results

3.1. The Scientific Landscape of Climate Action and Well-Being in a Policy Context

The bibliometric analysis documents a large and rapidly expanding research field. Annual scientific production more than tripled over the analyzed period, from 134 documents in 2020 to 441 in 2025, corresponding to a compound annual growth rate of 27%, with a short plateau in 2022–2023 followed by a marked acceleration in 2024–2025 (Figure 2a). Seventy-nine percent of the corpus is available in open access, and 45% of the documents are the product of international co-authorship, confirming the strongly collaborative character of this research area. The most productive sources reflect its interdisciplinary orientation at the intersection of policy analysis, environmental science, energy research, and public health: Sustainability leads with 68 documents, followed by Climate Policy (43), Environmental Research Letters (39), Energy Research and Social Science (28), Environmental Science and Policy (24), and the International Journal of Environmental Research and Public Health, the Journal of Environmental Management, and Energies (22 each) (Figure 2b). The country structure of the corpus is dominated by the United States (351 affiliation appearances) and the United Kingdom (315), followed by China (177), Germany (176), Australia (120), the Netherlands (106), Italy (102) and Canada (97); the visibility of India (79) alongside China indicates that the research agenda, while still concentrated in high-income countries, is no longer exclusively theirs.

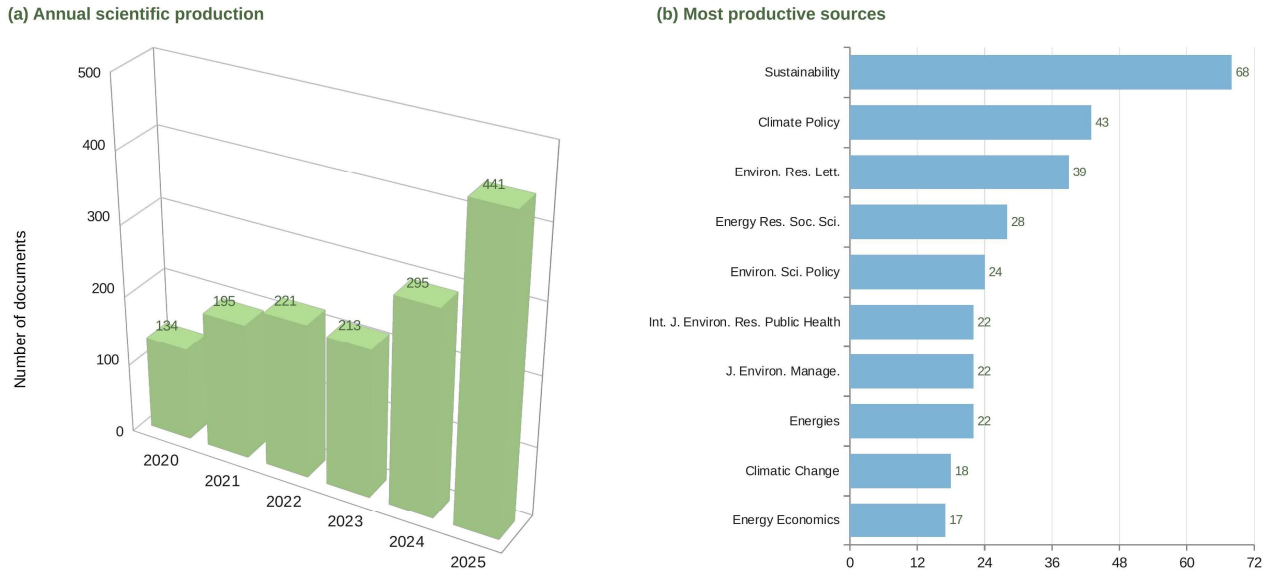


Figure 2. Scientific production on climate action and human well-being in a policy context (Scopus, n = 1499 documents, 2020–2025). (**a**) Annual scientific production; (**b**) most productive sources. Data: Supplementary Database S1.

The most cited documents of the corpus illustrate its thematic breadth and the maturity of its quantitative core. The systematic review of decoupling evidence by Haberl et al. [66] leads with more than 770 citations, followed by the narrative review of climate change impacts on mental health and emotional well-being by Lawrance et al. [67], the review of co-benefits and synergies between urban mitigation and adaptation measures by Sharifi [68], and the modelling studies of Cheng et al. [69] and Liu et al. [70] on the air quality and health consequences of carbon neutrality pathways in China. Also among the most cited

are the country-level assessment of land-based mitigation measures by Roe et al. [71], the co-benefits evaluation of the Chinese emissions trading policy by Dong et al. [72], the systematic review of smart cities and the Sustainable Development Goals by Sharifi et al. [73], and the political ecology critique of just transitions by Bouzarovski [22]. These works anticipate the cluster structure described below: just transition scholarship, adaptation and well-being research, quantified mitigation co-benefits, and cross-sectoral sustainable development framing.

The co-occurrence network of the 45 most frequent author keywords (430 links) resolves the field into four thematic clusters identified by Louvain community detection (Figure 3). Cluster K1, just transition, energy poverty and climate justice, is the largest and most politically oriented: it gathers just transition (142 occurrences), climate policy (128), energy transition (52), energy poverty (42), climate action (32), climate justice (30), energy policy, renewable energy, environmental justice, equity, energy justice, gender, justice and inequality, and constitutes the political core of the field [20–22]. Cluster K2, adaptation, nature-based solutions and well-being, is organized around climate adaptation (187 occurrences, the most frequent keyword of the corpus), nature-based solutions (59), well-being (55), ecosystem services (38), urban planning (36), resilience, vulnerability, public health, mental health, food security, biodiversity and green infrastructure, and corresponds to the adaptation and quality of life research stream documented at the urban scale [74–77], now visibly extended toward the ecosystem dimension of well-being; the operationalization of green infrastructure through planning and assessment instruments such as strategic environmental assessment is one of the active fronts of this cluster [78]. Cluster K3, mitigation co-benefits and air quality, links climate mitigation (143), co-benefits (102) and air pollution (49) with governance, energy efficiency, decarbonization, trade-offs and human health, reproducing at keyword level the health co-benefits agenda and its increasingly quantified evidence base [6,13,69,70,72,79]. Cluster K4, sustainable development goals and cross-sectoral policy, gathers the Sustainable Development Goals (94), sustainability (57), sustainable development (55), greenhouse gas emissions, agriculture, energy and environmental policy, and represents the cross-sectoral framing layer through which climate action is connected to the broader development agenda [73].

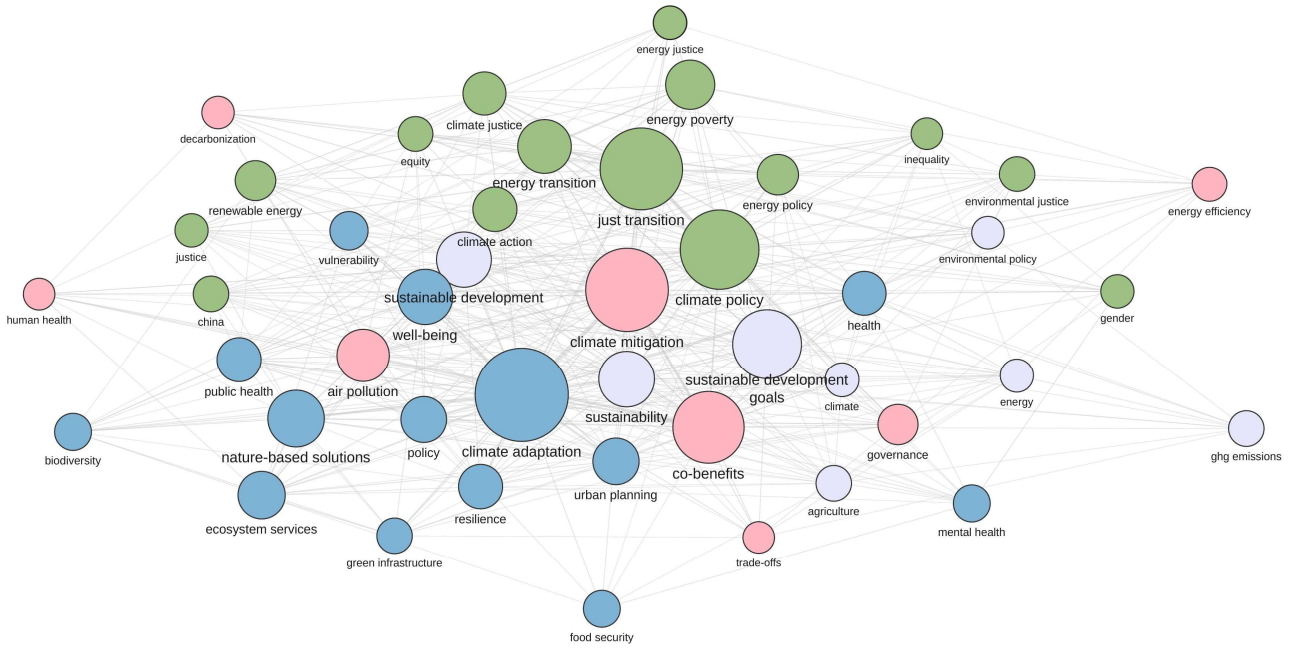


Figure 3. Keyword co-occurrence network of the corpus (45 most frequent author keywords after harmonization; 430 links). Node size is proportional to keyword frequency and link width to co-occurrence frequency. Node colour indicates the thematic cluster identified by Louvain community detection: K1, just transition, energy poverty and climate justice (sage green); K2,

adaptation, nature-based solutions and well-being (serene blue); K3, mitigation co-benefits and air quality (soft pink); K4, sustainable development goals and cross-sectoral policy (calm lavender). Data: Supplementary Database S1.

Compared with the conceptual structure of the broader well-being and climate literature that we used as interpretive anchor (Supplementary Database S1), two observations stand out. On the one hand, the sufficiency and decent living standards agenda [4,5,80–83] and the beyond-GDP measurement debate [84–86] do not form a distinct keyword community in the policy-oriented corpus, suggesting that demand-side well-being research still reaches the policy literature only indirectly, through the decoupling debate at its margins [66]. On the other hand, energy poverty emerges as a central node of the largest cluster and mental health as an established component of the adaptation cluster [67], indicating that two well-being dimensions that were peripheral in earlier literature have moved to the core of the policy-oriented research agenda.

3.2. The State of the Art, 2023–2025: What the Recent Syntheses Tell a Policy Audience

Keyword clusters describe how a research field is organized, not what it concludes. To answer the second part of our first research question, we summarize what the most recent syntheses of the field, published in 2023–2025 (Table 1), would convey to a European policy audience. Four messages stand out. First, the health evidence is mature and increasingly European. The systematic review by Moutet et al. [48] establishes that strategies consistent with net-zero emissions in energy, transport, food and buildings deliver substantial public health co-benefits, mainly through air quality, diet and physical activity; Tonne et al. [47] quantify these gains for European mitigation pathways and argue that health should be an explicit objective rather than a by-product of EU climate policy; the 2024 report of the Lancet Countdown documents record health threats from delayed action [40]; and Cuevas et al. [49] show that the health co-benefits of carbon pricing are conditional on revenue recycling that protects vulnerable households. Second, the justice evidence has moved from normative claims to mechanisms. Dwarkasing [51] shows that the social outcomes of low-carbon transition policies are determined by pre-existing inequality, van Bommel and Höffken [52] identify procedural justice as a condition for legitimate acceleration, Betts-Davies et al. [53] show that redistribution mechanisms are not interchangeable, and von Malmborg [54] traces how policy entrepreneurs shaped the version of just transition that EU climate neutrality policy institutionalized. Third, the adaptation and urban evidence has consolidated around nature-based solutions and vulnerability. Systematic reviews establish the flood resilience and health co-benefits of nature-based solutions [60] and of urban green infrastructure [59], resilience frameworks now integrate social, ecological and technological systems with explicit attention to justice [61], and vulnerability to climate-related health impacts in cities is understood as socially and institutionally produced [62], with specific attention to gender [65], disability [64] and place-based mental health [63]. Fourth, the sufficiency evidence remains thin but consistent: low energy demand futures for buildings are compatible with decent living standards [56], and low-consumption lifestyles show neutral to positive effects on subjective well-being [57].

The institutional assessments add the European framing. The IPCC Synthesis Report defines climate-resilient development as the integration of adaptation and mitigation with equity and justice, and notes that the window for such pathways is closing rapidly [39]. The European Climate Risk Assessment finds that Europe is the fastest-warming continent and that several risks to health, food security, ecosystems and social cohesion have already reached critical levels, with adaptation policy lagging behind [41]. The European Scientific Advisory Board on Climate Change concludes that progress toward the 2030 and 2040 targets is insufficient in several sectors and recommends, among other measures, ensuring a fair transition, addressing energy poverty and strengthening governance and participation [42]. Dupont et al. [46], finally, read three decades of EU climate policy as a process of institutionalization accompanied by growing politicization, in which the climate neutrality framework is consolidated but implementation and fairness remain contested. Taken together, the recent syntheses converge on three propositions directly relevant to this study: health

is the best quantified well-being benefit of mitigation; distributional design decides whether climate policy improves or worsens well-being; and adaptation is the domain in which the distance between evidence and policy is widest.

3.3. Well-Being in the EU Climate Policy Corpus, 2019–2024

The policy corpus comprises 25 documents: 14 legally binding instruments (nine regulations, four directives and one decision) and 11 soft-law documents (ten communications and one Council recommendation). Their temporal distribution mirrors the legislative cycle of the Green Deal (Figure 4): strategic communications dominate the 2019–2021 period, whereas 2023–2024 is characterized by the adoption of binding instruments implementing the Fit for 55 package and the new green industrial policy agenda.

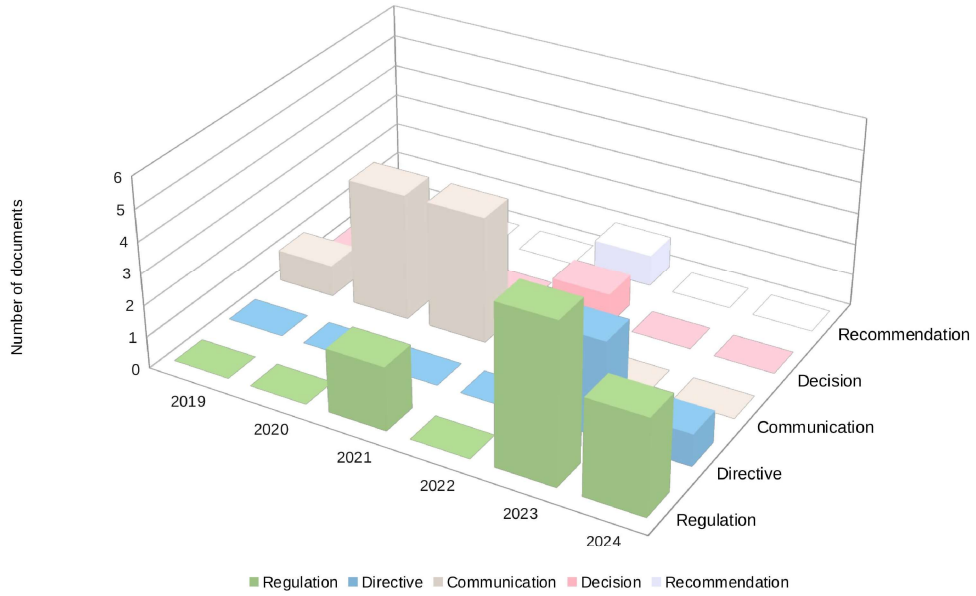


Figure 4. Composition of the EU climate policy corpus (2019–2024) by year and instrument type (n = 25 documents; Supplementary Database S2). Bar height indicates the number of documents adopted or published per year.

The coding of well-being dimensions shows a broad but uneven incorporation of social objectives (Figure 5). Equity and distributional fairness is the most pervasive dimension, present in 19 of the 25 documents, followed by employment and just transition and by quality of life and living environment (16 documents each). Health and energy poverty each appear in 11 documents, and participation in 12. On average, each document engages 3.4 of the six dimensions. The framing documents of the Green Deal cycle, together with the Council Recommendation on ensuring a fair transition and the Social Climate Fund Regulation, are the most comprehensive, engaging all or nearly all dimensions, whereas narrowly sectoral instruments such as the Effort Sharing and LULUCF amendments engage a single dimension.

Two patterns deserve particular attention. First, the social provisions of EU climate law have hardened over the analyzed period: dimensions that in 2019–2021 appeared mainly in strategies (energy poverty, just transition, distributional safeguards) are, by 2023–2024, embedded in binding instruments, most explicitly in the Social Climate Fund Regulation, in the extension of emissions trading to buildings and road transport with its accompanying redistribution obligations, in the energy poverty provisions of the recast Energy Efficiency and Buildings Directives, and in the territorial mechanism of the Just Transition Fund. Second, the health dimension follows the opposite pattern: although health co-benefits form one of the strongest clusters of the scientific corpus (K3, Section 3.1), health appears in only 5 of the 14 binding instruments and remains concentrated in soft-law documents such as the Zero Pollution Action Plan and the Adaptation Strategy, typically as a framing rationale rather than as an operational obligation.

Policy document	H	EP	JT	EQ	PA	QL
The European Green Deal	✓	✓	✓	✓	✓	✓
Council Recommendation on a fair transition	✓	✓	✓	✓	✓	✓
8th Environment Action Programme	✓		✓	✓	✓	✓
A Renovation Wave for Europe	✓	✓	✓	✓		✓
Social Climate Fund		✓	✓	✓	✓	✓
EU Strategy on Adaptation to Climate Change	✓			✓	✓	✓
European Climate Law	✓		✓	✓	✓	
Farm to Fork Strategy	✓		✓	✓		✓
Just Transition Fund		✓	✓	✓	✓	
Energy Performance of Buildings Directive (recast)	✓	✓		✓		✓
Energy Efficiency Directive (recast)		✓		✓	✓	✓
Renewable Energy Directive (RED III)		✓	✓	✓	✓	
New EU Forest Strategy for 2030			✓		✓	✓
Zero Pollution Action Plan	✓			✓		✓
European Climate Pact				✓	✓	✓
Fit for 55 package (framing communication)		✓	✓	✓		
CO_2 emission standards for cars and vans	✓		✓			✓
Nature Restoration Regulation	✓				✓	✓
Revised EU ETS Directive (including ETS2)		✓	✓	✓		
Circular Economy Action Plan			✓			✓
Carbon Border Adjustment Mechanism			✓	✓		
REPowerEU Plan		✓		✓		
LULUCF Regulation (amended)						✓
Effort Sharing Regulation (amended)				✓		
Net-Zero Industry Act			✓			

Figure 5. Presence of well-being dimensions in the EU climate policy corpus (document-level coding; Supplementary Database S2). Documents are ordered by the number of well-being dimensions engaged. H, health; EP, energy poverty and affordability; JT, employment and just transition; EQ, equity and distributional fairness; PA, participation and procedural dimensions; QL, quality of life and living environment.

3.4. Inside the Binding Instruments: How Well-Being Provisions Are Operationalized

Because a presence/absence code cannot convey how deeply a dimension is embedded in an instrument, we examined the operative provisions of four binding acts that carry most of the social architecture of the framework. The Social Climate Fund Regulation [29] is the clearest case of operationalization: it introduces definitions of energy poverty and transport poverty into EU climate law, obliges Member States to prepare Social Climate Plans targeting vulnerable households, vulnerable micro-enterprises and vulnerable transport users, finances structural measures such as building renovation and access to zero-emission mobility alongside temporary direct income support, and ties the Fund's resources, up to EUR 65 billion for 2026–2032, to the auctioning of allowances under the new emissions trading system. The revised Emissions Trading Directive [87] extends carbon pricing to buildings and road transport fuels and couples it with a price-containment mechanism and with revenue earmarking for social purposes, institutionalizing the compensation logic that the distributional literature has advocated. The recast Energy Performance of Buildings Directive [88] requires national renovation trajectories that prioritize worst-performing buildings and obliges Member States to address energy poverty and vulnerable households in their building renovation plans, linking the quality of the living environment directly to affordability safeguards. The European Climate Law [27], finally, anchors the procedural dimension: it establishes the European Scientific Advisory Board on Climate Change, requires the Commission to assess the consistency of Union and national measures with the climate neutrality objective, and frames the transition with explicit reference to fairness and solidarity. Across these four acts, the well-being provisions are not rhetorical gestures: they create definitions, funds, obligations and institutions. At the same time, the examination confirms the asymmetry identified by the coding, as none of the four instruments contains comparable operative provisions on health outcomes, despite the maturity of the health co-benefits evidence.

3.5. Correspondence Between Scientific Themes and Policy Provisions

The confrontation of the two corpora reveals a differentiated picture. Convergence is strongest between cluster K1 and the binding social instruments: the analytical vocabulary of the just transition and energy poverty literature (vulnerable households, affected territories and workers, distributional impact) is directly traceable in the operative provisions of the Just Transition Fund, the Social Climate Fund and the fair transition Recommendation, and energy poverty, the keyword that moved to the core of the recent literature, now has a legal definition and a dedicated funding stream (Section 3.4). A second, more recent convergence concerns the ecosystem component of cluster K2: with the adoption of the Nature Restoration Regulation in 2024, the nature-based solutions agenda crossed for the first time from strategy into binding restoration obligations, closely tracking the growth of this research stream [71]. Partial convergence characterizes the remainder of K2: the Adaptation Strategy, the Renovation Wave and the buildings legislation operationalize improvements of the living environment, yet adaptation planning with explicit well-being objectives remains largely a soft-law and local-level matter [75,77], and the mental health dimension visible in the literature [67] has no regulatory counterpart at all. Divergence is clearest for cluster K3: despite an extensive and quantitatively mature evidence base on avoided mortality and health gains [69,70,72], no binding climate instrument in our corpus establishes health outcome obligations, monitoring requirements, or health-based target-setting, leaving the health rationale in a supporting rhetorical role. Cluster K4, finally, is reflected diffusely rather than instrumentally: the cross-sectoral sustainable development framing permeates the Green Deal Communication and the 8th Environment Action Programme, but by its nature it generates orientation rather than obligations.

Modelling the recent syntheses, the six dimensions and the policy corpus as a single network makes this correspondence measurable (Figure 6 and Table 2). The network comprises 56 nodes and 152 links: 67 links connect the 25 syntheses to the dimensions they address, and 85 links connect the 25 policy documents to the dimensions on which they contain provisions, of which 44 belong to binding instruments. Health is the dimension most frequently addressed by recent syntheses (14 of 25) but appears in only 5 of the 14 binding instruments, giving it the lowest evidence-policy coupling index of the six dimensions (0.54). Employment and just transition show the opposite profile: addressed by 8 syntheses, it appears in 9 binding instruments and has the highest coupling index (1.71), followed by participation (1.33) and energy poverty (1.14). Equity (0.90) and quality of life (0.89) are close to parity. Reading the network by evidence stream confirms the pattern: the just transition and justice syntheses connect to dimensions that are carried, on average, by 8.3 binding instruments each, whereas the health and co-benefits syntheses connect to dimensions carried by 6.9 binding instruments on average. The network also makes visible where the recent evidence has no regulatory counterpart at all. The mental health and solastalgia evidence [63], the disability-inclusive agenda [64] and the sufficiency syntheses [56,57] reach the policy corpus only through the generic quality of life and equity dimensions, and none of their specific propositions is traceable in a binding provision. Betweenness centrality identifies equity (0.34) and quality of life (0.24) as the dimensions through which most evidence-to-law paths run, consistent with their role as the general-purpose vocabulary in which EU climate law expresses its social objectives.

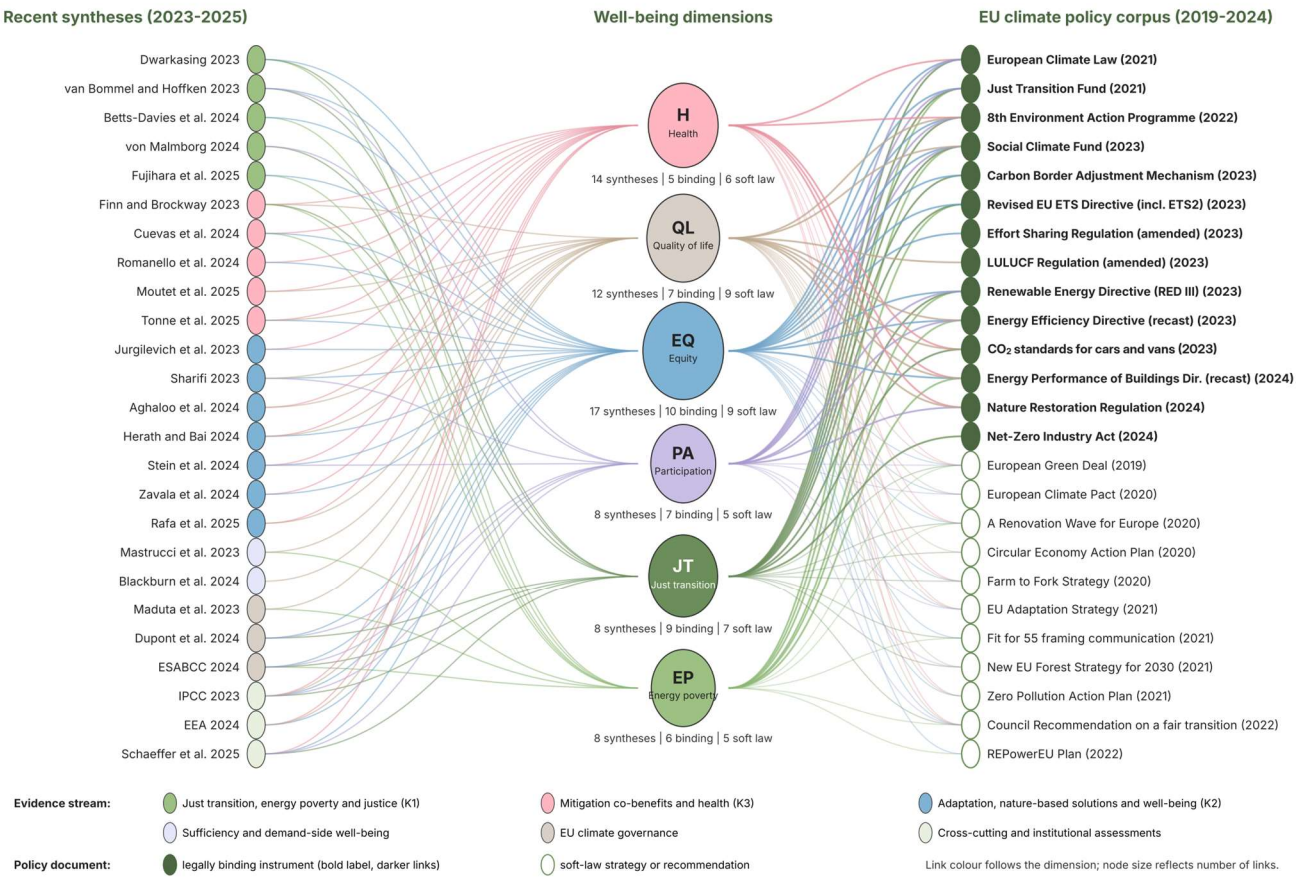


Figure 6. Evidence-policy correspondence network. Left: the 25 recent syntheses (2023–2025) listed in Table 1 [39–42,45–65], coloured by evidence stream (sage green, just transition, energy poverty and justice; soft pink, mitigation co-benefits and health; serene blue, adaptation, nature-based solutions and well-being; lavender, sufficiency and demand-side well-being; warm beige, EU climate governance; light green, cross-cutting and institutional assessments). Centre: the six well-being dimensions, with node size proportional to the total number of links and, below each node, the number of syntheses, binding instruments and soft-law documents linked to it. Right: the 25 EU policy documents, filled dark green for legally binding instruments (bold labels, darker links) and white for soft-law documents. Link colour follows the dimension. Data: Table 1, Supplementary Database S1 (Key_Syntheses sheet) and Supplementary Database S2.

Table 2. Evidence-policy coupling by well-being dimension. Syntheses: number of recent syntheses (of 25) addressing the dimension; documents: number of policy documents (of 25) with provisions on the dimension, split into binding instruments (of 14) and soft-law documents (of 11); coupling index: share of the dimension in the links of binding instruments divided by its share in the links of syntheses (values below 1 indicate that evidence has outrun binding regulation).

Dimension	Syntheses	Documents	Binding	Soft Law	Share of Synthesis Links (%)	Share of Binding Links (%)	Coupling Index
Health (H)	14	11	5	6	20.9	11.4	0.54
Energy poverty and affordability (EP)	8	11	6	5	11.9	13.6	1.14
Employment and just transition (JT)	8	16	9	7	11.9	20.5	1.71
Equity and distributional fairness (EQ)	17	19	10	9	25.4	22.7	0.90
Participation and procedural (PA)	8	12	7	5	11.9	15.9	1.33
Quality of life and living environment (QL)	12	16	7	9	17.9	15.9	0.89

4. Discussion

4.1. A Partial Translation of Evidence into Regulation

Our results depict the EU climate framework as a case of partial and selective translation of scientific evidence into regulation. The trajectory of the just transition agenda, from academic concept to trade union demand and then to binding redistribution instruments within a single decade, shows that the science-policy pathway can operate rapidly when scientific findings align with politically salient concerns and with identifiable constituencies [20,32]. It is telling that just transition and energy poverty jointly anchor the largest cluster of the recent literature (K1, Section 3.1) and are at the same time the dimensions whose provisions hardened fastest in EU law, to the point of acquiring legal definitions and a dedicated fund (Section 3.4). The creation of the Social Climate Fund, directly linked to the extension of carbon pricing, is particularly notable because it institutionalizes the compensation logic advocated by the distributional literature [14,29]. In the terms proposed by Cash et al. [23], this stream of evidence achieved credibility, salience and legitimacy simultaneously; network analyses of EU climate policy communities suggest that actors occupying brokerage positions play a measurable catalytic role in precisely this kind of agenda consolidation [44].

The weaker regulatory uptake of health co-benefits, by contrast, illustrates the persistence of well-known barriers to evidence use [24]. Health gains from mitigation accrue diffusely, across policy competences that in the EU remain largely national, and lack the institutional advocates that just transition provisions found in trade unions and regional governments. The result is a systematic asymmetry: the cluster with arguably the strongest quantitative evidence base, including modelling studies that count avoided deaths under carbon neutrality pathways and systematic reviews that now consolidate this evidence for Europe [7,8,47,48,69,70], is the least operationalized in binding law. We consider this asymmetry consequential for the design of enduring climate action, because health co-benefits are among the most effective framings for sustaining public support for climate policy over time [13]. The recent trajectory of the nature-based solutions agenda offers a counterexample worth studying: within roughly five years, ecosystem restoration moved from a rising research theme to a binding EU regulation, suggesting that a well-defined regulatory object and a dedicated legislative vehicle can shorten the distance between evidence and law.

4.2. Why Climate Policy May Not Improve Well-Being: The Mitigation-Adaptation Balance

The asymmetries documented above raise a question that has been debated for a quarter of a century and that our findings allow to pose more precisely: why may climate policy fail to improve well-being? The oldest version of the argument is the one associated with Lomborg [89,90], according to which mitigation delivers welfare gains only in the distant future and at high cost, whereas adaptation and targeted development interventions are cheaper and can be directed to the populations most in need; on this reading, a policy mix dominated by mitigation would serve well-being poorly even if it served the climate well. The argument has been contested on its empirical premises, in particular the discounting of future damages and the underestimation of non-market and catastrophic impacts [1,91], and the Sixth Assessment Report concludes that adaptation faces hard and soft limits that tighten rapidly with warming, so that it cannot substitute for mitigation [1,39]. Its distributional core nonetheless retains analytical value, because it identifies three mechanisms through which climate policy may leave well-being unchanged or worse: when the costs of mitigation fall on those least able to bear them; when the benefits of mitigation accrue too diffusely and too late to be perceived; and when adaptation, which delivers the most immediate well-being gains for the most exposed populations, is neglected relative to mitigation.

Our results speak to each mechanism. The first is the one the EU framework has addressed most decisively: the Social Climate Fund, the revenue earmarking of the revised emissions trading system and

the energy poverty provisions of the buildings and efficiency directives are, in effect, the regulatory answer to the regressivity critique (Sections 3.4 and 3.5), and the recent syntheses confirm that this answer is well founded, since the health and equity outcomes of carbon pricing depend on exactly such revenue recycling [49]. The second mechanism is where the framework is weakest: health co-benefits are the best quantified and most immediate welfare gains of mitigation [47,48], yet no binding instrument makes them an objective, a monitoring requirement, or a target, so that a benefit that could make mitigation visibly welfare-improving remains invisible in law. The third mechanism is the most striking in our data. Climate adaptation is the most frequent keyword of the corpus (187 occurrences against 143 for climate mitigation), the adaptation cluster is the one in which the well-being vocabulary of the field concentrates (well-being, public health, mental health, resilience, vulnerability), and the European Climate Risk Assessment finds adaptation policy lagging behind risks that are already critical [41]. In the policy corpus, however, adaptation is carried almost entirely by soft law: the Adaptation Strategy is a communication, the only binding adaptation anchor is the general obligation of Article 5 of the European Climate Law, and none of the 14 binding instruments establishes adaptation objectives with a well-being content comparable to the social provisions attached to mitigation. The shift of the research field toward adaptation that the bibliometrics reveal has, so far, no regulatory counterpart.

Two further mechanisms, not anticipated in the earlier debate, emerge from the recent syntheses. One is maladaptation: adaptation interventions can themselves reinforce vulnerability when they are designed without attention to the distribution of their effects [92,93], which cautions against reading a binding adaptation obligation as a well-being gain in itself. The other is the political fragility of policies whose benefits are not perceived: climate policies experienced as costly and unfair invite reversal, and reversal forfeits the primary well-being benefit of climate protection [13,46]. The practical implication for enduring climate action is therefore not to rebalance the EU framework from mitigation toward adaptation, a reading that the evidence on adaptation limits forecloses, but to give the adaptation and health dimensions the regulatory treatment that just transition has received: definitions, obligations, monitoring and a funding stream.

4.3. Implications for Enduring Climate Action and Social Well-Being

Three implications follow for the agenda of this Topic. First, the durability of climate action is inseparable from its well-being performance, and this connection has acquired a new urgency. Recent indicator updates show that the remaining global carbon budget consistent with the 1.5-degree limit has shrunk to the equivalent of only a few years of current emissions [94], and legal scholarship argues that fundamental rights require climate protection commensurate with that constraint [12]. In such a context, the social design of climate policy is not a secondary concern: instruments that demonstrably protect vulnerable groups while delivering visible improvements in quality of life are more resistant to political backlash, and policy reversal would forfeit the primary well-being benefit of climate protection itself. The hardening of social safeguards observed in our corpus can therefore be read as an institutional learning process oriented toward sustaining ambition, not as a substitute for it. Second, the absence of a distinct sufficiency and decent living standards cluster in the policy-oriented literature, despite the strength of this agenda in the broader well-being scholarship [4,5,82], marks the current frontier of the science-policy interface: incorporating demand-side well-being evidence would require regulatory instruments that address consumption levels and service provisioning, not only technology standards. Third, we consider that the EU experience offers a transferable template, with appropriate contextualization, for other jurisdictions pursuing an ecological civilization agenda, in which climate regulation is explicitly designed as well-being policy rather than as a constraint upon it.

4.4. Limitations

Five limitations qualify our findings. First, the bibliometric corpus is drawn from a single database and a deliberately policy-focused search strategy covering 2020–2025; this design matches the Green Deal legislative cycle and ensures topical relevance, but it excludes earlier foundational work, non-English scholarship and publications indexed only elsewhere, so the corpus should be read as the recent policy-oriented core of the field rather than its entirety [33]. We note that the present corpus results from a substantially broadened search string relative to our original design and is more than four times larger, and that the thematic architecture proved robust to this broadening, with the just transition, adaptation and well-being, and co-benefits clusters stable across both corpora; this robustness strengthens our confidence in the cluster-level findings. Second, our policy coding captures the presence of well-being provisions, not their stringency, budgetary weight, or implementation; a presence/absence design necessarily treats a recital and a binding obligation within the same dimension as equivalent. The qualitative examination of four binding instruments in Section 3.4 partially corrects this, but a systematic depth-of-provision scale remains to be developed. Third, our design characterizes how well-being dimensions are incorporated in the architecture of EU climate law; it does not assess the climate effectiveness of the instruments, that is, whether their combined stringency is consistent with the EU's share of the rapidly shrinking global carbon budget, a question on which recent assessments raise serious doubts [12,94]. Integrating effectiveness metrics with well-being coding is, in our view, the most important extension of this work. Fourth, the correspondence between literature clusters and policy provisions is associational and does not establish the causal influence of specific publications on specific provisions; bibliographic references in impact assessments and the citation behaviour of EU institutions would be required for such an attribution. Fifth, the review of recent syntheses rests on a purposive selection of 25 documents coded by a single author; the selection privileges highly cited reviews and European scope, and the coupling index is a descriptive ratio that depends on the number of syntheses per dimension. A larger, independently coded set of syntheses would make the index more robust, although we note that the ranking of dimensions it produces coincides with the one obtained independently from the document-level coding and from the qualitative reading of the binding instruments.

4.5. Future Research

Future work should extend the present design in four directions: (i) extending the evidence-policy correspondence network introduced in Section 3.5 from a purposive set of syntheses to the full corpus of reviews and from document-level to provision-level coding, which would allow the formal measurement of evidence-policy coupling with the network analysis toolkit developed in environmental governance research and recently applied to brokerage in EU climate policy networks [43,44]; (ii) developing an ordinal depth-of-provision scale that distinguishes recitals, objectives, obligations and funded mechanisms, to replace the binary coding used here; (iii) extending the policy corpus longitudinally to the post-2024 legislative cycle, including the 2040 climate target framework, to test whether the hardening of well-being provisions continues; and (iv) replicating the analysis in other jurisdictions, to establish whether the EU pattern of selective translation, strong on just transition and weak on health operationalization, is general or institutionally specific.

5. Conclusions

In this study, we set out to establish how far the scientific evidence linking climate action to human well-being is reflected in the European climate policy framework, understanding the social and health dimensions examined as the design layer that conditions the feasibility and durability of climate protection, not as a substitute for it. The bibliometric analysis of 1499 Scopus-indexed documents shows a large, rapidly growing, strongly collaborative and largely open-access research field, whose keyword structure resolves into four

clusters: just transition, energy poverty and climate justice; adaptation, nature-based solutions and well-being; mitigation co-benefits and air quality; and sustainable development goals and cross-sectoral policy. The analysis of 25 EU policy documents adopted between 2019 and 2024, complemented by a qualitative reading of the operative provisions of four binding instruments, shows that well-being has become a structural component of European climate regulation: just transition and energy poverty provisions migrated from strategies into binding law, acquiring legal definitions, obligations and a dedicated fund, and ecosystem restoration followed the same path in 2024, while health co-benefits remain rhetorically present but operationally weak. The review of 25 recent syntheses and the evidence-policy correspondence network built on them confirm this asymmetry quantitatively: health is the dimension with the most abundant recent evidence and the least coupled to binding law, whereas employment and just transition are the most strongly coupled. The same analysis identifies adaptation as the frontier of the gap: it has become the most frequent theme of the research field and the one in which well-being is most explicitly addressed, yet it remains the least binding component of the EU framework. The overall picture is one of partial translation: European climate policy increasingly behaves as well-being policy, but selectively, following political salience rather than the weight of scientific evidence alone. Closing the identified gaps, above all the operationalization of health co-benefits and the regulatory uptake of demand-side well-being research, would strengthen both the social legitimacy and the durability of climate action, and would bring climate governance closer to the integrative ideal of an ecological civilization, in which planetary stability and quality of life are pursued as a single objective.

Supplementary Materials

The following supporting information can be found at: https://www.sciepublish.com/article/pii/1338, Table S1: Revised search protocol for the bibliometric corpus; Table S2: Well-being coding scheme applied to the policy corpus; Table S3: The EU climate policy corpus (2019–2024) and document-level well-being codes; Table S4: The 45 keywords of the co-occurrence network, with frequency and cluster membership; Table S5: Author-curated seed corpus used as interpretive anchor for the keyword clusters; Table S6: Robustness of the keyword clustering; Table S7: The 25 recent syntheses (2023–2025) with their evidence stream and well-being coding; Supplementary Database S1: Literature corpus (Scopus export, n = 1499), curated seed corpus, search protocol and replication note, harmonized keyword frequencies, co-occurrence edge list with VOSviewer-compatible files, and the coded set of recent syntheses (DB1_Literature_ClimateAction_WellBeing.xlsx). Supplementary Database S2: EU climate policy corpus and well-being coding scheme (DB2_EU_Climate_Policy_Corpus.xlsx). Editable versions of all figures and the figure generation scripts are available from the author.

Statement of the Use of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the author used Claude (Anthropic) in order to edit the text and to assist with data curation. After using this tool, the author reviewed and edited the content as needed and takes full responsibility for the content of the published article.

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Ethics Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The data supporting the findings of this study are available in the Supplementary Materials (Supplementary Database S1, Supplementary Database S2 and Supplementary Tables S1–S7). The bibliographic records were retrieved from Scopus (Elsevier), and the policy documents analyzed are publicly available on EUR-Lex.

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Declaration of Competing Interest

The author declares no conflict of interest.

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