Fair transition to climate neutrality

A Scoping Study

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Scope of the study

The transition to climate neutrality entails profound systemic transformations that extend beyond technological innovation and economic restructuring. It involves significant changes in social practices, institutional arrangements, and normative frameworks. As the European Union intensifies its efforts to implement the European Green Deal, including through the Clean Industrial Deal, and achieve climate neutrality by 2050, growing attention is being directed to the governance and distributive dimensions of the transition. Ensuring that the transformation is equitable, socially cohesive, and responsive to territorial diversity is a central concern in both policy and research agendas. Fairness and inclusiveness are key principles of the European Green Deal to ensure that no person and no place is left behind in the transition to a climate-neutral society. The Council Recommendation on a fair transition towards climate neutrality further guides Member States in addressing the social and labour dimensions of this process.

Rapid decarbonisation that is required to reach the EU targets of a 55% reduction in greenhouse gases compared to 1990s levels by 2030, and net zero emissions by 2050, entails far-reaching changes in employment, income stability, lifestyles, and cultural practices. If not governed inclusively, it risks provoking social resistance and deepening existing inequalities, particularly among vulnerable groups such as low-income households, older people, and persons with disabilities. Distributional effects of climate policies must therefore be anticipated and addressed to prevent social fragmentation and ensure cohesion. At the same time, lasting and legitimate change depends on active citizen engagement, trust in scientific evidence, and confidence in democratic institutions.

This is a joint report contains two on scoping studies carried out by Edoardo Croci (first part) and Zuzana Harmáčková (second part) on different aspects of a fair transition towards climate neutrality. The study has been prepared in the context of the forthcoming European Partnership on Social Transformations and Resilience (STR) under the EU's framework programme for research and innovation, Horizon Europe. Expected to be launched in 2027, this Partnership aims to create a transformative research and innovation programme in the social sciences and humanities to strengthen resilience, fairness, inclusiveness, and social cohesion in response to major societal challenges, including climate change. This study is part of the preparatory phase of the STR Partnership's Strategic Research and Innovation Agenda (SRIA) and contributes specifically to the impact area on *Fair Transition to Climate Neutrality*.

The STR partnership's guidance proposal identifies seven themes for research and innovation activities under the impact area on a fair transition to climate neutrality. These include:

i. *Conceptualisation of fairness*, informed by diverse economic, political, and cultural traditions;
ii. *Attitudes, values, and lifestyles*, as drivers or barriers to behavioural and systemic change;
iii. *Trust and legitimacy*, which underpin effective policy uptake and democratic governance;
iv. *Climate policy instruments and frameworks*, considering their differential social impacts;
v. *Systemic design approaches*, to integrate social sciences and humanities into innovation pathways;
vi. *Democratisation of the transition*, focusing on participatory mechanisms and social dialogue;
vii. *Green-digital nexus*, exploring both synergies and tensions between technological and ecological transformations.

Based on these themes, the overall objective of this study is to identify emerging research directions and knowledge gaps that could inform future funding priorities of the STR Partnership. Rather than providing normative recommendations, the study offers a critical examination of existing research pathways to individuate emerging and underexplored questions and to drive future investigation. The present study is divided into two parts: Part I and Part II. Part I (from pag. 10 to pag. 52), focuses on four themes that are particularly salient from a social sciences perspective: i) conceptualisation of fairness, ii) climate policy instruments, iii) systemic design approaches, and iv) the green-digital nexus. The remaining three themes: i) attitudes, values, and lifestyles; ii) trust and legitimacy; iii) democratisation of the transition - more closely aligned with cultural and philosophical inquiries typically addressed within the humanities - are analysed in the second part (Part II from pag. 53 to pag. 97). This introduction and the conclusions aim to establish a common framework, summarize the main findings that have emerged, and outline potential new research directions to be integrated into the partnership's SRIA.

Part I is structured into three sections. The second section outlines the methodology adopted, which combines a review of relevant academic literature, an analysis of EU-funded research projects (primarily under Horizon 2020 and Horizon Europe), and an assessment of thematic convergences and divergences across knowledge domains. The second section presents the results for each of the four selected thematic areas, integrating conceptual insights, project-based evidence, and the identification of research lines. The final section provides a cross-cutting discussion, highlighting the main results and the indications aimed at informing the continued development of the SRIA regarding the i) conceptualisation of fairness, ii) climate policy instruments, iii) systemic design approaches, and iv) green-digital nexus topics.

Part II is structured into five sections. The first section outlines the assessment approach, which combines a review of peer-reviewed academic literature, science-policy reports, and research outputs from Horizon 2020 and Horizon

Europe projects. The second section introduces integrative themes that connect the selected domains, including interdisciplinarity, systems thinking, and the interplay between values, institutions, and governance. The third section examines attitudes, values, and lifestyles topic identifying gaps related to the actionability of values, the role of culture and emotion, governance representation, private sector engagement, youth perspectives, and the need for longitudinal studies. The fourth section focuses trust and legitimacy topic, reviewing current debates and highlighting research needs around institutional trust, participatory governance, legitimacy assessment, and the impact of misinformation. The fifth section addresses the democratization and transition topic, emphasizing co-design, economic and technological justice, inclusive and digital participation, civil society empowerment, and structural barriers to democratic engagement.

PART I – Edoardo Croci

1. Methodology for the scoping study

This study traces the evolution of research on fair transition to climate neutrality, identifying key trends and highlighting areas requiring further exploration. The analysis focuses across four interrelated topics relevant to the just transition: ***i) Conceptualization of fairness; ii) Climate policy instruments; iii) Systemic design approaches; and iv) Green-digital nexus***.

The methodological approach combines a systematic review of academic literature with an analysis of EU-funded research projects. This dual focus allows for a coherent and comparable examination of how the fair green transition is framed, conceptualised, and translated into practice across both scholarly and policy-oriented domains. The methodology is structured around three main steps.

The first step consisted of a systematic literature review conducted through the Scopus database, with the objective of identifying the most relevant peer-reviewed publications for each of the selected topics related to the just transition. A dedicated search query was defined for each topic (see Table 1). The search was limited to publications written in English, published from 2015 onwards, and confined to subject areas within the social sciences, including business, management and accounting, economics, econometrics, and finance. These filters were applied to ensure alignment with the socio-economic and governance dimensions of the just transition. Following the retrieval of publications, a screening process was applied to select the most relevant contributions. Selection was based on two criteria: thematic relevance, assessed through abstract screening; and citation count, with a minimum threshold of five citations to ensure scientific impact. To complement the database search, a snowballing technique was employed to include additional publications cited in the most relevant sources. The selected articles were then analysed to identify methodologies, recurring themes - supported by word cloud visualisation - and the evolution of topics over time. This process allowed for the identification of key research lines for each topic relevant to the just transition.

In parallel, a review of EU-funded research projects was conducted using the CORDIS (Community Research and Development Information Service) database. In coherence with the literature review, only projects launched after 2015 were considered. Specific queries were developed for each topic, aligned with the ones used for publications and adapted to suit the structure and functionality of the CORDIS database (see Table 1). Project abstracts were first screened based on the presence of relevant keywords, followed by text analysis to verify their relevance with respect to the selected topic. The selected projects

have been analysed in order to identify their temporal distribution, the evolution of the themes addressed, and their content.

TOPIC	LITURATURE	EU-FUNDED PROJECTS
Conceptualization of fairness	"fair transition" OR "just transition" AND "climate" AND "concept" OR "definition" OR "model"	contenttype='project' AND (('fair transition' OR 'just transition') AND 'climate' AND ('concept' OR 'definition' OR 'model'))
Climate policy instruments	"climate policy" AND "instrument" OR "framework" AND "social impact*" OR "vulnerab*" OR “social equity”	contenttype='project' AND 'climate policy instrument' OR climate policy framework AND ('social impact*' OR 'vulnerab*' OR 'social equity')
Systemic design approaches	("systemic design" OR "human centred design") AND ("social innovation") AND ("green" OR "just" OR "fair") AND ("transition")	contenttype='project' AND ('systemic design' AND 'Human centered design' AND 'social innovation' AND 'green transition' OR 'fair transition' OR 'just transition')
Green-digital nexus	('green' AND 'digital' AND 'transition') AND ('fair' OR 'just*' OR 'social*')	contenttype='project' AND ('green' AND 'digital' AND 'just transition' OR 'fair transition' OR 'Social transition')

Table 1: Literature and EU-funded project queries

The third step of the methodology aimed to assess the extent to which the research lines identified through the academic literature review are reflected in EU-funded research projects. This phase served to detect areas of convergence, where academic research priorities align with the thematic focus of the projects, and areas of divergence, where important themes from the literature are not adequately addressed in project. The analysis was conducted by systematically comparing the main lines of research emerging from the literature with the thematic content of the selected EU-funded projects.

The identification of convergences and divergences between academic research and EU-funded projects served to clarify the extent to which the topic of just transition is currently addressed. This step was instrumental in outlining future research priorities to be integrated into the Strategic Research and Innovation Agenda (SRIA), with the aim of ensuring that just transition is approached in a more comprehensive and coordinated way. By examining the alignment across the four thematic areas—conceptualisation of fairness, climate policy instruments, systemic design approaches, and the green-digital nexus—the analysis contributed to identifying which aspects of just transition are being actively developed and which remain insufficiently explored. This comparative assessment provides an essential foundation for guiding research programming and ensuring that future work supports the operationalisation of just transition across diverse sectors and governance levels.

2. Scoping results: literature and EU funded projects review

2.1. Conceptualization of fairness

2.1.1. Literature review

Through the literature review on *Conceptualisation of fairness* topic a total of 220 publications have been identified. Table 2 summarises the distribution of publications over time, highlighting a marked increase, particularly after 2021 with more than 80% of the total, indicating a growing scholarly interest in the topic in recent years.

YEAR OF PUBLICATION	PUBLICATION	%
2015	1	0.45%
2018	7	3.18%
2019	6	2.73%
2020	14	6.36%
2021	32	1.,55%
2022	43	19,55%
2023	44	20,00%
2024	74	33,18%

Table 2 Literature review results distribution over time

Based on citation count, and abstract analysis, 19 publications were selected for in-depth analysis. The selected publications are listed in Table 3 including: author(s), title, year of publication and journal. At the country level, the US and Australian institutions emerge as the leading contributors (respectively 29% and 15.8%), followed by the UK (13.2%).

AUTHOR	TITLE	Y.	TYPE	JOURNAL/BOOK
Cigna et al.	Varieties of Just Transition? Eco-Social Policy Approaches at the International Level	2023	Journal	Social Policy and Society
Ciplet, Harrison	Transition tensions: mapping conflicts in movements for a just and sustainable transition	2020	Journal	Environmental Politics
Ehresman, Chukwumerije	Environmental justice and conceptions of the green economy	2015	Journal	International Environmental Agreements
Eisenberg	Just transitions	2019	Journal	Southern California Law Review
Galgóczi et al.	Just transition on the ground: Challenges and opportunities for social dialogue	2020	Journal	European Journal of Industrial Relations

AUTHOR	TITLE	Y.	TYPE	JOURNAL/BOOK
Harry et al.	Contesting just transitions: Climate delay and the contradictions of labour environmentalism	2024	Journal	Political Geography
Heffron and McCauley	What is the 'Just Transition'?	2018	Journal	Geoforum
Jamal and Hales	Performative justice: new directions in environmental and social justice	2016	Journal	Geoforum
Johansson	Just Transition as an Evolving Concept in International Climate Law	2023	Journal	Journal of Environmental Law
Kwauk and Casey	A green skills framework for climate action, gender empowerment, and climate justice	2022	Journal	Development Policy Review
Lei et al.	Addressing carbon inequity: Examining factors driving the path to just transition	2023	Journal	Environmental Impact Assessment Review
Manta et al.	The Architecture of Financial Networks and Models of Financial Instruments According to the "Just Transition Mechanism" at the European Level	2020	Journal	Journal of Risk and Financial Management
Moodie et al.	Towards a territorially just climate transition—assessing the Swedish EU territorial just transition plan development process	2021	Journal	Sustainability
Obeng-Odoom	Oil Cities in Africa: Beyond Just Transition	2021	Journal	American Journal of Economics and Sociology
Stark et al.	Just Transitions' Meanings: A Systematic Review	2023	Journal	Society and Natural Resources
Stevis et al.	Global labour unions and just transition to a green economy, International Environmental Agreements	2015	Journal	Politics, Law and Economics
Stevis et al.	Planetary just transition? How inclusive and how just?	2020	Journal	Earth System Governance
Velicu, Barca	The Just Transition and its work of inequality	2020	Journal	Sustainability: Science, Practice, and Policy
White	Just Transitions/Design for Transitions: Preliminary Notes on a Design Politics for a Green New Deal	2018	Journal	Capitalism Nature Socialism

Table 3 Selected papers

The analysis of the topic evolution during time, highlighted that from 2015 to 2019, publications focused on labour, legal frameworks, and energy-sector reform, grounding fairness in distributive and environmental justice. Between 2020 and 2022, the debate shifted toward regional inequalities, and the governance approaches necessary to deliver just transitions. In 2023 and 2024, the literature expanded conceptually and geographically, incorporating global justice, shared responsibility, and multilevel governance for shaping fair transition outcomes. The word cloud (Figure 1) reveals that the most recurrent topics in the literature focus on environmental, social and economic dimensions of development. Other two interesting clusters of recurrent topics are justice, rights, fair and group, community and people, giving evidence to the social dimension of fairness.

Finally, terms like international, world and global suggest a strong emphasis of fairness also in the context of international policies.

Figure 1 Conceptualisation of fairness publications word cloud

Main methodologies adopted by the selected publications (Table 4) are Theoretical Analysis (52.6%), Literature review (21.1%) and Mixed methods (15.8%), indicating a reliance on secondary sources and conceptual analysis.

METHODOLOGIES	RECURRENCIES
THEORETICAL ANALYSIS	52.6%
LITERATURE REVIEW	21.1%
MIX-METHODS	15.8%
CASE STUDY ANALYSIS	5.3%
SPATIAL ANALYSIS DISTRIBUTION	5.3%

Table 4: Methodologies adopted

2.1.2. EU funded projects review

Through CORDIS search, a total of 47 EU-funded projects were identified under the *Conceptualisation of fairness* topic. After the screening, 27 projects were selected for detailed analysis (Annex 1). Of these, 59.3% were funded through the Horizon 2020 programme, while 40.7% received funding under Horizon Europe. Most of the selected projects started in 2021 (22.2%), 2022 (25.9%), and 2023 (22.2%) (Figure 2). Project coordinators are predominantly based in Italy (25.5%) and Germany (22.2%), followed by the Netherlands and Finland (both 11.1%).

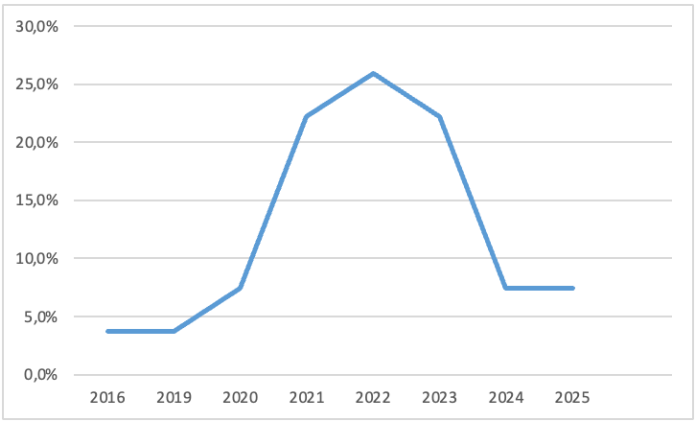

Figure 2: Conceptualization of Fairness projects' start year distribution during time

Early projects (2016–2020) focused on the foundational dimensions of fairness, including territorial cohesion and regional disparities. Between 2021 and 2023, the thematic scope broadened to include gender equality, participatory governance, and interdisciplinary frameworks for just transition. The most recent projects (2024–2025) show increasing emphasis on the intersection of digitalisation and environmental justice, with growing attention to institutional innovation for inclusive transitions.

2.1.3. Content analysis and narrative summary

Literature on the *Conceptualisation of fairness* within just transitions reflects a growing interest on the topic. The reviewed publications approach fairness as a multi-dimensional principle. Three principal lines of research emerge reflecting how fairness is understood, institutionalised, and contested within climate and socio-economic transformation processes.

The first line of research addresses the normative and conceptual foundations of fairness. A significant body of work explores how fairness is defined within and across justice, and how it relates to broader frameworks of climate, environmental, and energy justice. Heffron and McCauley (2018) propose an integrative model that brings together distributive, procedural, and restorative dimensions of justice, suggesting that fairness in transition contexts must account for both immediate material outcomes and broader patterns of recognition and participation. Eisenberg (2019) argues that just transition should be codified as a legal principle, particularly to protect structurally disadvantaged communities exposed to the adverse impacts of decarbonisation. Johansson (2023) traces how just transition has gained traction in international climate law, moving from a principle rooted in labour protection to a broader normative framework encompassing human rights and social vulnerability. Stark et al. (2023), through a systematic literature review, highlight the proliferation of justice framings in recent scholarship and policy, noting that these often lack conceptual coherence and institutional anchoring, which complicates their translation into policy practice. These studies show that fairness remains an evolving and plural

concept whose meaning is shaped by disciplinary orientation, institutional location, and political context. They also underline the importance of addressing intergenerational equity, particularly in relation to how present-day decisions distribute risks and benefits over time.

The second line of research focuses on the governance and institutional dimensions of fairness, particularly how just transition principles are embedded in multilevel policy frameworks. Stevis and Felli (2020) provide a conceptual framework for assessing the inclusiveness and ambition of just transition governance. They distinguish between weak and transformative visions, with the former confined to labour-market adjustment, and the latter engaging in broader socio-ecological reconfigurations. Moodie et al. (2021), in their case study of Sweden's Territorial Just Transition Plans, find that social justice considerations are often secondary to economic competitiveness and technological feasibility, suggesting that the institutional translation of fairness remains limited in practice. These contributions underline that fairness is not only a normative concern but also an institutional and procedural one, dependent on how governance systems are structured and whose stakeholders are engaged in the planning and implementation of transition policies. Moreover, this line of research pays increasing attention to geographical and territorial equity, recognising that uneven regional capacities, labour market exposures, and institutional infrastructures significantly influence the distribution of transition outcomes.

The third line of research critically examines structural inequality and reparative justice in the context of transition policies, with a particular focus on the historical and systemic roots of dispossession and marginalisation. Velicu and Barca (2020) argue that mainstream approaches to just transition tend to treat justice as an additive principle rather than as a structural reconfiguration of political economy. Obeng-Odoom (2021) develops this critique further by addressing how most adopted transition models in African contexts fail to confront the legacies of land alienation, rent extraction, and capitalist expansion. He calls for a reparative justice framework that includes redistribution, land rights, and recognition of historical injustices. Finally, literature reviews by Stark et al. (2023), Galgóczi et al. (2020), and Ehresman and Okereke (2015) provide critical syntheses that clarify theoretical divergences, gaps, and the need for integrative analytical frameworks. Stark et al. (2023) systematically map the proliferation of justice-related terms, showing how conceptual inconsistency and lack of operational clarity hinder the practical deployment of fairness in policy settings. Galgóczi et al. (2020), through a review of transition experiences in key industrial sectors (energy and mobility), underscore the fragmented institutional responses to social justice and the lack of convergence between labour, environmental, and regional policy. Their review reveals significant implementation gaps and highlights the limitations of current governance models to address structural challenges. Ehresman and Okereke (2015), taking a broader environmental justice perspective, analyse the dominant narratives within green economy frameworks and demonstrate how competing interpretations of fairness reflect divides between equity, efficiency, and growth. Taken together, these reviews highlight

how concerns related to coherence, contextual sensitivity, and justice are increasingly reflected in current discussions on climate governance. Additionally, they document how the concept of fairness is being articulated at the intersection of social equity, environmental justice, and political economy.

The analysis of EU-funded projects demonstrates a strong degree of convergence with the three major lines of research emerging from academic literature. While several projects explicitly address fairness as a multidimensional principle, combining environmental, social, and economic concerns, others engage with the concept more implicitly through themes such as inclusion, territorial cohesion, or long-term equity.

Regarding the first research line on normative and conceptual foundations of fairness, several projects explicitly engage with it, addressing questions related to the definition, measurement, and ethical implications of fairness in transition contexts. JUSTNORTH is a notable example, exploring diverse normative frameworks of justice in Arctic and Northern peripheries, where fairness is interpreted through culturally specific and legally pluralistic lenses. AdJUST similarly investigates how different interpretations of just transition across regions, policy domains, and institutional actors can be mapped and operationalised. REBALANCE contributes by proposing a broader reframing of European democratic values and political imaginaries, embedding fairness into discussions of post-growth governance and societal wellbeing. These projects echo the literature's concern with the lack of conceptual coherence in fairness discourses and the need to articulate frameworks that combine distributive, procedural, and intergenerational dimensions. However, while these projects raise critical normative questions, few advance explicit legal proposals for institutionalising fairness as a principle.

A second group of projects aligns closely with the second research line on governance and institutional dimensions of fairness and the extent to which justice principles are embedded in multi-level governance structures. BOLSTER focuses on the representation of marginalised communities in regional just transition planning, examining both procedural justice and territorial disparities. JUSTNature engages with fairness through co-designed nature-based solutions in urban areas, linking participatory design to environmental and spatial justice. TANDEM, and INHERIT explore how participatory and deliberative methods can be integrated into local and regional governance, with the aim of making climate decision-making more legitimate, inclusive, and responsive. EC2 applies the concept of energy citizenship to democratise energy systems and ensure broader access to transition benefits. These projects operationalise fairness through tools for stakeholder engagement, equity assessment, and governance innovation following the literature's emphasis on territorial equity, procedural legitimacy, and institutional capacity. Nonetheless, while governance approaches are well developed, few projects challenge the underlying policy paradigms that constrain the transformative potential of just transition frameworks.

The third research line, which focuses on the historical and structural foundations of inequality, finds more limited resonance among EU-funded projects. Nevertheless, several initiatives do engage with systemic exclusion and the need for redistributive responses. READJUST addresses the social impacts of green and digital transitions, highlighting the risks faced by vulnerable regions and proposing governance reforms sensitive to structural disadvantage. Just Fashion takes a transnational perspective by examining how climate transition affects labour rights and ecological outcomes along global value chains, particularly in the fashion sector. gEneSys introduces a gender lens by exploring how energy systems are shaped by unequal power relations and by proposing pathways toward gender-just transitions. These projects respond to literature that calls for a deeper interrogation of how class, gender, race, and global inequalities shape both the costs and governance of transition processes. However, very few projects explicitly adopt a reparative justice approach, and themes such as historical accountability, land rights, and structural redistribution remain peripheral in EU-funded research.

Overall, EU-funded projects exhibit a quite strong alignment with “normative and conceptual foundations of fairness” and “governance and institutional dimensions of fairness” research lines identified in the literature. Projects addressing normative foundations and institutional design demonstrate growing sophistication in conceptualising and operationalising fairness as a multidimensional and context-dependent principle. Participatory governance, territorial justice, and inclusive planning are prominent and well-developed across many initiatives. However, divergences also emerge. While certain projects address gender inequality, regional marginalisation, or global asymmetries, few adopt a critical perspective that explicitly challenges existing economic and institutional structures. Topics such as historical injustice and reparative redistribution are rarely foregrounded in the EU project landscape.

2.2. Climate policy instruments and frameworks

2.2.1. Literature review

The literature review concerning *Climate policy instruments and frameworks* returned comprehensively 163 publications. Table 5 summarizes the distribution of publications over time, highlighting a progressive increase after 2022, representing more than 50% of the total with 21.5% of publications concentrated in 2024.

YEAR OF PUBLICATION	PUBLICATION	%
2015	7	4.3%
2016	4	2.4%
2017	11	6.7%

YEAR OF PUBLICATION	PUBLICATION	%
2018	15	9.2%
2019	15	9.2%
2020	12	7.4%
2021	15	9.2%
2022	28	17.2%
2023	21	12.9%
2024	36	21.5%

Table 5 Literature review results distribution over time

Based on citation count, abstract analysis, and snowballing method, 22 publications were selected for in-depth analysis. These are listed in Table 6 including: author(s), title, year of publication and journal. At the country level, the US, Germany and Swiss institutions emerge as the leading contributors for the topic.

AUTHOR	TITLE	Y.	TYPE	JOURNAL/BOOK
Abrell et al.	How robust is the uniform emissions pricing rule to social equity concerns?	2018	Journal	Journal of Environmental Economics and Management
Antimiani et al.	Mitigation of adverse effects on competitiveness and leakage of unilateral EU climate policy: An assessment of policy instruments	2016	Journal	Ecological Economics
Beck et al.	Carbon tax and revenue recycling: impacts on households in British Columbia	2015	Journal	Resource and Energy Economics
Carattini et al.	How to win public support for a global carbon tax	2019	Journal	Nature
Dennig et al.	Inequality, climate impacts on the future poor, and carbon prices	2015	Journal	Proceedings of the National Academy of Sciences of the United States of America
Dolge and Blumberga	Composite risk index for designing smart climate and energy policies	2021	Journal	Environmental and Sustainability Indicators
Fremstad	The impact of a carbon tax on inequality	2019	Journal	Ecological economics
Fried et al.	The distributional effects of a carbon tax on current and future generations	2018	Journal	Review of Economic Dynamics
Koasidis et al.	Towards a green recovery in the EU: Aligning further emissions reductions with short- and long-term energy-sector	2022	Journal	Energy Policy
Laurent	Just transitions	2024	Book	Elgar
Maestre-Andrés et al.	Perceived fairness and public acceptability of carbon pricing: a review of the literature	2019	Journal	Climate Policy
Malafry and Brinca	Climate policy in an unequal world: Assessing the cost of risk on vulnerable households	2022	Journal	Ecological Economics
Malik et al.	Climate policy accelerates structural changes in energy employment	2021	Journal	Energy policy
Oei et al.	Lessons from Germany's hard coal mining phase-out: policies and transition from 1950 to 2018	2020	Journal	Climate Policy

AUTHOR	TITLE	Y.	TYPE	JOURNAL/BOOK
Rausch et al.	Household heterogeneity, aggregation, and the distributional impacts of environmental taxes	2016	Journal	Resource and Energy Economics
Rodríguez-Pose and Bartalucci	The green transition and its potential territorial discontents	2024	Journal	Cambridge Journal of Regions, Economy and Society
Rusmadi et al.	Gendering the climate change policy: A study of gender analysis on Semarang's integrated city climate strategy	2017	Journal	Advanced Science Letters
Santos et al.	Impacts of carbon pricing on Brazilian industry: Domestic vulnerability and international trade exposure	2018	Journal	Sustainability
Schumacher et al.	Distributional impacts of CO2 pricing - focus on the buildings sector	2022	Journal	Eceee Summer Study Proceedings
Su	The impacts of carbon pricing on coastal megacities: A CGE analysis of Singapore	2017	Journal	Journal of Cleaner Production
Zimmerman n and Pye	Inequality in energy and climate policies: Assessing distributional impact consideration in UK policy appraisal	2018	Journal	Energy Policy

Table 6 Selected publications

Topic evolution highlighted that between 2015 and 2018, research focused on the economic design of carbon pricing instruments, exploring their effectiveness and how the generated revenues could be used to mitigate social costs and support climate goals. From 2019 to 2022, attention expanded toward public acceptance, distributional effects, and the socio-political dimensions of decarbonisation, including inequality and employment shifts. The most recent literature (2024) reflects growing concerns about territorial and institutional implications of the green transition, emphasising differentiated regional impacts and the need for more context-sensitive policy frameworks. The word cloud (Figure 3) reveals that the most recurrent words are just and justice. In conjunction with these, the papers revolve around climate, environmental, and social dimensions. Additionally, the strong presence of words development, change and transition reflects the relevance of the evolution of policy instruments.

Figure 3 Climate policy instruments and frameworks publications word cloud

Methodologies adopted by the selected publications (Table 7) are Econometric analysis and Multicriterial analysis (both 28.6%).

METHODOLOGIES	RECURRENCIES
ECONOMETRIC ANALYSIS	28.6%
MULTICRITERIA ANALYSIS	28.6%
LITERATURE REVIEW	9.5%
INPUT-OUTPUT TABLES	9.5%
IMPACT ASSESSMENT	9.5%
MIXED METHODS	4.8%
THEORETICAL ANALYSIS	4.8%
SURVEY	4.8%

Table 7 Methodologies adopted

2.2.2. EU funded projects review

Through CORDIS search, 238 EU-funded projects were identified under the *Climate policy instruments and frameworks* topic. After the screening, 28 projects were selected for detailed analysis (Annex 1). Of these, 55% were funded through the Horizon 2020 programme, 40% through Horizon Europe and 5% though ERC. Most of them started in 2016 (25%), 2022 (19%), and 2020 and 2023 (both 14.3%) (Figure 4). Project coordinators are predominantly based in Spain (45%) followed by Germany and Italy (both 10%).

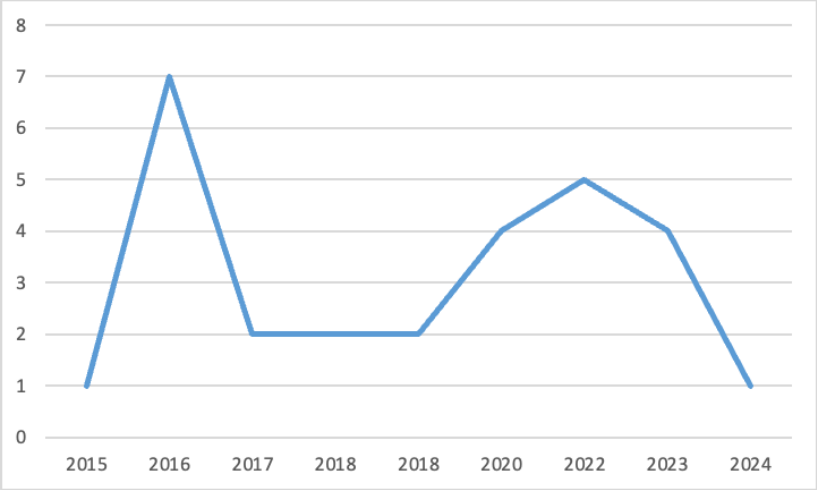

Figure 4 Climate policy instruments and frameworks projects' start year distribution during time

The thematic focus of projects changed overtime. From 2015 to 2019, early projects concentrated on the technical development of environmental policy instruments, particularly related to resource efficiency, environmental footprints, and public service design. Between 2020 and 2023, the scope widened to include resilience and more dynamic models linking climate instruments to social innovation and behavioural change. Most recently, projects starting in 2024 and

2025 highlight a shift towards distributional impacts, regional equity, and the need for integrated, participatory instruments that can support just and adaptable policy frameworks across diverse territorial contexts.

2.2.3. Content analysis and narrative summary

Literature on *Climate policy instruments and frameworks* reflects a dynamic and interdisciplinary research field, engaging critically with how different policy instruments are designed, implemented, and evaluated in relation to their economic performance, social acceptability, and equity implications. Three main research lines emerge.

The first one concerns the distributional and equity effects of climate policy instruments. Beck et al. (2015) assess British Columbia's carbon tax using a computable general equilibrium model and find that it is progressive when revenues are recycled to households. Rausch et al. (2016) and Malafry and Brinca (2022) similarly highlight that the distributional consequences of carbon pricing depend heavily on household heterogeneity, including income level and risk aversion. Schumacher et al. (2022) show that when carbon pricing in the building sector is combined with electricity cost relief, lower-income groups may experience net welfare gains. Fried et al. (2018) and Dennig et al. (2015) contribute by embedding inequality-sensitive metrics into climate policy modelling, proposing that socially differentiated impacts be addressed explicitly during the policy design phase. These studies emphasise that climate instruments are not distributionally neutral, and that fairness must be treated as a core design criterion alongside environmental effectiveness.

A second research line emerges from the analysis is public acceptability and behavioural responses. For example, Maestre-Andrés et al. (2019) through an extensive literature review provide an overview of empirical studies on carbon tax acceptability, demonstrating that perceptions of fairness - particularly concerning revenue use - play a crucial role in shaping support. Their findings underscore the importance of transparent, redistributive design in securing policy legitimacy. Carattini et al. (2019) provide empirical evidence that acceptance increases when revenues are redistributed transparently or used to fund visible environmental projects. The review of the literature of Oei et al. (2020) synthesise international experiences with coal phase-out strategies, showing how sequencing, compensation, and stakeholder engagement influence the success and social acceptance of transition policies. Geiger et al. (2021) further argue that support is conditioned by how individuals evaluate policy trade-offs between economic, environmental, and social dimensions. Their findings suggest that affective and cognitive assessments of fairness and benefit-sharing play a critical role in determining the political feasibility of climate instruments.

A third line of research focuses on institutional design and robustness. Dolge and Blumberga (2021) develop a composite risk index to assess the political,

economic, and administrative vulnerabilities of climate and energy policies. Abrell et al. (2018) and Antimiani et al. (2016) apply computable general equilibrium and optimal tax modelling to analyse how carbon pricing functions under conditions of international trade exposure and leakage risk. These studies highlight the importance of policy credibility, flexibility, and institutional alignment to ensure that climate instruments can function effectively over time and across governance levels.

The analysis of EU-funded projects shows substantial convergence with the main research trajectories emerging from the academic literature. Rather than treating instruments purely as regulatory or economic tools, many of these projects engage with them as multidimensional mechanisms that must combine environmental effectiveness, social fairness, behavioural responsiveness, and policy coherence.

A significant number of projects focus on the first research line on distributional impacts of climate policies. ENPOR addresses energy poverty in the private rented sector, developing targeted instruments to protect vulnerable tenants and ensure fair access to energy efficiency improvements. DIGNITYFIRM investigates how green transitions intersect with labour exploitation, especially among undocumented migrant workers in the agri-food sector. Projects such as FINEPRINT, MOVING, and ITFLOWS extend the equity lens to spatial and global dimensions, examining how environmental footprints are unequally distributed across regions, sectors, and countries. These efforts align closely with literature highlighting the importance of incorporating inequality-sensitive indicators and recognising that climate instruments are not distributionally neutral. The project LIFE COASE, although still in early stages, also contributes by assessing compensation mechanisms within emissions trading systems, reflecting growing interest in how financial flows from carbon pricing can be redistributed to mitigate regressive effects. Many projects also engage with spatial and sectoral disparities, with particular attention to territorial cohesion, gender equity, and localised risks. gEneSys applies a gender perspective to energy system transformation, emphasising how structural exclusions and institutional bias limit access to benefits from green policies. ACCREU and Just4All investigate the specific vulnerabilities of regions and communities facing uneven transition pressures, calling for differentiated instruments that reflect local labour markets, demographic structures, and historical exposure.

Several projects address issues related to the second research line on behavioural dimensions, reflecting the growing body of work that identifies fairness perceptions as a key driver of public acceptability. Projects like GREENPATHS and SoGreen emphasise participatory co-design as a method to improve the legitimacy and support of climate policies. HIROSS4all provides an example of implementation at the local level, combining energy efficiency interventions with social support in low-income neighbourhoods. These projects echo research findings that underscore the

importance of perceived fairness, trust, and transparency, particularly in relation to how revenues are used, or benefits are shared. However, while participation is well developed, the projects engage less directly with the cognitive dimension of fairness identified in behavioural studies, which stress the psychological underpinnings of public response to policy trade-offs.

The third line of research on institutional design and robustness are also prominent concerns. Projects such as EUCalc and INNOPATHS offer modelling platforms that allow policymakers to simulate trade-offs and evaluate the impacts of climate policies on socio-economic indicators. EERAdata provides data tools to support energy renovation strategies, particularly for local governments, enhancing a most efficient resource allocation. TANDEM adds a methodological innovation by combining expert-based modelling with participatory equity assessments, aiming to build more responsive and legitimate climate instruments through dialogue and co-production. RESIST and STUDIES-DIG explore institutional innovation as a precondition for climate resilience and policy integration, bridging technical design with governance reform. These initiatives reflect the literature's emphasis on institutional robustness and alignment, although few projects explicitly focus on policy vulnerability, administrative risk, or the long-term durability of instruments over time. Although labour market aspects are sometimes analysed, few projects directly address the dynamics of employment transitions in carbon-intensive sectors or propose dedicated instruments for reskilling and job reallocation, which remain more fully explored in academic literature.

The overall landscape of EU-funded projects shows significant alignment with the expanded research agenda found in academic literature. Many projects integrate distributional concerns, apply participatory methods, and link climate policy to institutional and territorial governance. Notably, the move toward multi-dimensional policy performance - considering cost, justice, and legitimacy in tandem - is reflected in both modelling-based and participatory initiatives. Nonetheless, some divergences persist exist. While social equity and governance are widely addressed, labour market dynamics, gender-sensitive policy design, and psychological determinants of public acceptability remain less systematically explored. Additionally, the role of policy design, compensation mechanisms, and revenue redistribution - central themes in the literature - are not always explicitly addressed in projects. The emphasis tends to fall on enabling conditions and participatory legitimacy, rather than on mechanisms for balancing trade-offs or mitigating resistance.

2.3. Systemic design approaches

2.3.1. Literature review

The literature review on *Systemic design approaches* topic returned comprehensively 108 results. Table 8 summarizes publications distribution over time highlighting a progressive concentration after 2021, representing more than 75% of the total, with a peak in 2024 (34.6%).

YEAR OF PUBLICATION	PUBLICATION	%
2016	3	2,80%
2017	4	3,74%
2018	2	1,87%
2019	10	9,35%
2020	6	5.6%
2021	15	14%
2022	18	16.8%
2023	12	11.2%
2024	37	34.6%

Table 8 Literature review results distribution over time

Based on citation count and abstract analysis 12 publications were selected for in depth analysis. These are listed in Table 9 including: author(s), title, year of publication and journal. At the country level, the European and US institutions emerge as the leading contributors representing respectively 55% and 40% of the total.

AUTHOR	TITLE	Y.	TYPE	JOURNAL/BOOK
Bryant et al.	The need for sectoral transition design: A case of the shift to renewable energy	2024	Journal	Technological Forecasting and Social Change
Ceschin et al.	Evolution of design for sustainability: From product design to design for system innovations and transitions	2016	Journal	Design Studies
Corubolo et al.	Transitioning Design-Orienting Scenarios for Food Systems: A Design Contribution to Explore Sustainable Solutions and Steer Action	2024	Journal	Sustainability (Switzerland)
Dyer et al.	Making urban design a public participatory goal: toward evidence-based urbanism	2017	Journal	Proceedings of the Institution of Civil Engineers - Urban Design and Planning
Fettes et al.	Collaborative planning, transitions management and design thinking: evaluating three participatory approaches to urban planning	2017	Journal	Australian Planner
Fettes et al.	Prompts for eco-social transformation: What environmental education can learn from transformative design	2024	Journal	Journal of Environmental Education
Franca et al.	An approach to business model innovation and design for strategic sustainable development	2017	Journal	Journal of Cleaner Production
Nickel et al.	Distilling Sustainable Design Concepts for Engineering Design Educators	2022	Journal	International Journal of Engineering Education

AUTHOR	TITLE	Y.	TYPE	JOURNAL/BOOK
Nohra et al.	Systemic design for policymaking: Towards the next circular regions	2020	Journal	Sustainability (Switzerland)
Parameswaran et al.	Social design-principles and practices to foster caring urban communities	2022	Book	Oliver Heckmann
Penty	Product Design and Sustainability: Strategies, Tools and Practice	2019	Book	Routledge
Vezzoli et al.	Methods and tools for system design for sustainability	2017	Book	Maggioli Editore
Vezzoli et al.	Design for sustainable consumption and production systems	2017	Book	Routledge
Villari et al.	Designing Sustainable Services for Cities: Adopting a Systemic Perspective in Service Design Experiments	2022	Journal	Sustainability (Switzerland)

Table 9 Selected publications

The analysis of the topics evolution highlighted that between 2016 and 2019 publications explored sustainability through the lens of business models and product-service systems, highlighting design's role in promoting environmental innovation. Between 2020 and 2022, the focus shifted toward design's capacity to support societal transitions, with growing attention to complexity, resilience, and multi-stakeholder collaboration. More recent research (2023–2024) reflects a turn toward transformative governance, integrating systemic design with policy, participatory planning, and long-term institutional change. The word cloud (Figure 5) shows that the most recurring topic across the papers is clearly design, consistently connected to sustainability, innovation, and development. Systemic design is frequently framed in relation to product, service and systems, as well as processes involving stakeholders and social challenges.

Figure 5 Systemic design approaches word cloud

Main methodologies adopted by the selected publications (Table 10) are Literature review and Theoretical analysis (both 35.7%) followed by Case study analysis (14.3%).

METHODOLOGIES	RECURRENCIES
LITERATURE REVIEW	35.7%
THEORETICAL ANALYSIS	35.7%

METHODOLOGIES	RECURRENCIES
CASE STUDY ANALYSIS	14.3%
INTERVIEWS	7.1%
MULTI CRITERIA ANALISYS	7.1%

Table 10 Methodologies adopted

2.3.2. EU funded projects review

Through CORDIS search, 75 EU-funded projects were identified for the *Systemic design approaches* topic. After the screening, 23 projects were selected for detailed analysis (Annex 1). Of these, 47.8% were funded through the Horizon 2020 programme, while 52.2% received funding under Horizon Europe. Most of the selected projects started in 2019 (17.4%) and between 2021 and 2023 (in total 56.5%) (Figure 6). Project coordinators are predominantly based in Spain (20.3%) and Belgium (16.7%), followed by Italy and Germany (both 12.5%).

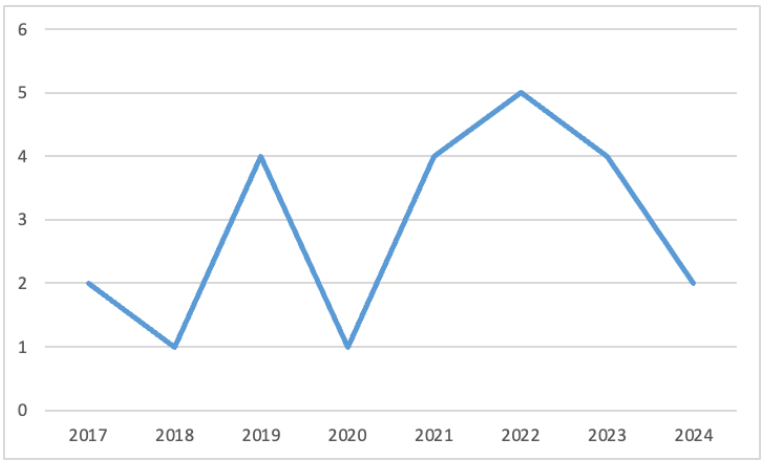

Figure 6 Systemic design approaches projects' start year distribution during time

Early projects (2017–2019) approached systemic design primarily through innovation in urban infrastructure, mobility, and resource efficiency, often within smart city frameworks. From 2020 to 2022, the focus broadened to include co-creation processes, social innovation, and design methodologies tailored to just and inclusive transitions. Recent projects (2023–2024) show a more integrated perspective, combining human-centred design, participatory governance, and circular economy principles to support system-level transformation across diverse sectors and territories.

2.3.3. Content analysis and narrative summary

The reviewed literature on *Systemic design approaches* reflects a growing interdisciplinary field that integrates design theory, sustainability studies, innovation, and governance. The analysed contributions converge around the

idea that systemic design is not merely a toolkit, but a framework for intervening in complex systems through processes that are multidisciplinary, value-driven, and oriented toward long-term transformation. Three main lines of research emerged from the analysis.

The first research line concerns the role of systemic design in enabling and steering large-scale sustainability transitions, particularly in the areas of circular economy, energy transformation, and territorial development. Nohra et al. (2020) and Bryant et al. (2024) examine how systemic design methodologies can support complex, multi-level governance processes, positioning design as a strategic tool for institutional and infrastructural change. Nohra et al. (2020), show how design can be deployed to develop place-based circular economy strategies that respond to local socio-economic and environmental conditions. Bryant et al. (2024) introduce the concept of “sectoral transition design” to conceptualise how designers can act within broader systems of production and regulation, particularly in high-impact sectors such as energy. In both cases, systemic design is framed not merely as a method for innovation but as a framework for coordinating actors, aligning objectives, and embedding sustainability in long-term development strategies.

The second line of research focuses on the participatory and collaborative dimensions of systemic design in managing the green and digital transition. Several contributions explore how co-design and stakeholder engagement processes can enhance the responsiveness and legitimacy of sustainability initiatives. Corubolo et al. (2024) present the Transitioning Design-Orienting Scenarios (T-DOS) as a methodological tool to support collective visioning and deliberation in complex systems, with specific application to food systems. Villari et al. (2024) analyse the application of service ecosystem design to urban contexts, arguing that systemic design enables institutions to navigate complexity, manage interdependencies, and foster inclusive innovation. These studies converge on the idea that systemic design facilitates not only the generation of solutions but also the transformation of relationships, values, and institutional arrangements.

The third line of research engages with the epistemological and educational foundations of systemic design, particularly as they relate to the development of sustainability-oriented knowledge, skills, and practices. Nickel et al. (2022) and Ceschin et al. (2022) conduct literature reviews that trace the evolution of design for sustainability, identifying how the field has shifted from product- and service-based approaches toward more systemic and transition-oriented paradigms. These reviews emphasise the need to develop new educational frameworks that reflect the complexity and interdisciplinarity of contemporary challenges. Franca et al. (2017) complement this perspective by demonstrating how strategic sustainability principles can be integrated into innovation processes through the combination of established tools such as the Business Model Canvas and the Framework for Strategic Sustainable Development. Together, these studies highlight how systemic design serves as a mode of inquiry that enables actors to

engage with complexity and embed long-term thinking into design education and practice.

EU-funded projects on systemic design approaches reflect a growing commitment to using design thinking not only as a method for innovation, but as a strategic framework for enabling inclusive, place-based, and long-term sustainability transitions. These projects align with the literature, which conceptualises systemic design as a tool for navigating complex transitions, coordinating diverse actors, and embedding sustainability across multiple scales and sectors. Across the project landscape, three main research orientations emerge: enabling large-scale transitions, supporting participatory governance, and strengthening education and knowledge systems for sustainable design.

A first group of projects aligns with research line that explores the role of systemic design in steering large-scale sustainability transitions, particularly in relation to the circular economy, energy systems, and territorial development. Projects such as ENGAGE and PARIS REINFORCE support the development of integrated policy pathways for emission reductions by combining design methodologies with modelling and scenario-building approaches. These projects position design as a tool to align sectoral objectives and stakeholder expectations in long-term planning. SHERPA and FIRELOGUE extend this approach by focusing on integrated territorial governance and risk management, addressing the complexities of climate adaptation and cross-sectoral interdependencies. The use of design in these projects is not limited to producing goods or services but contributes to reshaping decision-making processes and embedding sustainability in strategic governance.

Another cluster of projects engages directly with the second line of research on participatory and collaborative dimensions of systemic design, reflecting the literature's emphasis on co-design as a vehicle for legitimacy, inclusion, and innovation. TANDEM and GREENPATHS exemplify this orientation by developing frameworks for participatory assessment and inclusive governance in climate transitions. Both projects operationalise systemic design through transdisciplinary engagement, bringing together policy actors, scientists, and citizens to co-create just and adaptive transition strategies. Similarly, COEVOLVERS focuses on community-led nature-based solutions through co- design processes that integrate ecological knowledge and local priorities. In the domain of food systems, projects such as FEAST and VALUMICS apply systemic design principles to reconfigure value chains and promote more sustainable consumption and production models. These initiatives reflect the literature's view of systemic design as a process that transforms not only outcomes, but also relationships, practices, and institutional logics. However, while they demonstrate strong commitment to inclusion, few projects explicitly address the challenges of scaling participatory methods across complex policy systems or ensuring their long-term institutionalisation.

The third research line on epistemological and educational foundations of systemic design, is less frequently foregrounded in EU-funded projects, however some of them do engage with knowledge production, capacity-building, and methodological development. For instance, crossCert and EeDaPP focus on improving the reliability and accessibility of data tools for energy performance, thereby strengthening the information systems needed to support sustainable renovation strategies. Although these projects are more technical in scope, they contribute to building the infrastructure through which design-led innovation can be mainstreamed and scaled. More broadly, the orientation toward design-informed policy modelling, as seen in ACTION and REALLOCATE, suggests growing interest in embedding systemic design into the development of public policy showcasing how it can improve energy use, mobility systems, and digital tools. Still, few projects directly engage with the educational transformation needed to provide future designers, planners, and policymakers with the skills required to work across systems and disciplines.

Projects show strong alignment with the evolving role of systemic design in sustainability transitions. Rather than treating design as a discrete intervention, these initiatives embed it into governance, policymaking, and social innovation processes. They reflect a shift from sectoral solutions to system-oriented approaches that address interconnections between environmental goals, social inclusion, and institutional reform. The projects demonstrate a clear awareness of the importance of place-based dynamics, stakeholder diversity, and long-term coordination. However, divergences remain, particularly in the limited attention to systemic design education and institutional shifts needed to incorporate sustain design-led transformation.

2.4. Green-digital nexus

2.4.1. Literature review

The literature review on *Green Digital Nexus* topic returned comprehensively 267 publications. Table 11 summarizes their distribution over time, highlighting its progressive increase particularly after 2022, with a peak in 2023 and 2024 representing 30.3% and 36.3% respectively.

YEAR OF PUBLICATION	PUBLICATION	%
2015	1	0.4%
2017	2	0.7%
2018	5	1.9%
2019	4	1.5%
2020	16	6%
2021	20	7.5%
2022	41	15.7%
2023	81	30.3%
2024	97	36.3%

Table 11 Literature review results distribution over time

Based on citation count and abstracts analysis, 17 publications were selected for in depth analysis. These are listed in Table 12 including author(s), title, year of publication and journal. At the country level, Chinese followed by Spanish, Italian, and Sweden institutions emerge as the leading contributors.

AUTHOR	TITLE	Y.	TYPE	JOURNAL/BOOK
Balogun et al.	Assessing the Potentials of Digitalization as a Tool for Climate Change Adaptation and Sustainable Development in Urban Centres	2019	Journal	Sustainable Cities and Society
Bianchi et al.	People-centred policies for a just transition (digital, green and skills)	2024	Journal	Contemporary Social Science
Canesi and Marella	Towards European Transitions: Indicators for the Development of Marginal Urban Regions	2023	Journal	Land
Dabbous et al.	The impact of digitalization on entrepreneurial activity and sustainable competitiveness: A panel data analysis	2023	Journal	Technology in Society
Elkady et al.	An empirical investigation into the role of Industry 4.0 tools in realizing sustainable development goals with reference to fast moving consumer foods industry	2024	Journal	Food Research International
Fan et al.	Digital technology application and enterprise competitiveness: the mediating role of ESG performance and green technology innovation	2023	Journal	Environment, Development and Sustainability
Heyman et al.	Digitalisation, Productivity and Jobs: A European Perspective	2021	Journal	The European Union and the Technology Shift.
Kaddour and Ghbara	Gender inequalities, poverty, and disparities: Impact and links in the era of digital transformations and green transition	2023	Journal	Centering Gender in the Era of Digital and Green Transition
Lopez-Sintas et al.	The social structuring of the digital gap in a developing country. The impact of computer and internet access opportunities on internet use in Thailand	2020	Journal	Technology in Society
Mondejar et al.	Digitalization to achieve sustainable development goals: Steps towards a Smart Green Planet	2021	Journal	Science of the Total Environment
Pan et al.	Knowledge mapping of resilience and human rights in supply chains: A road mapping taxonomy for twin green and digital transition design	2023	Journal	Frontiers in Environmental Science
Saikia B.	Industry 5.0 - its role toward human society: Obstacles, opportunities, and providing human-centered solutions	2023	Journal	Fostering Sustainable Businesses in Emerging Economies: The Impact of Technology
Schulmeister	Financial instability, climate change and the "digital colonization" of Europe: Some unconventional proposals	2020	Journal	Financial Crisis Management and Democracy
Timmermans et al.	Introduction to the special issue on “the twin (digital and green) transition: handling the economic and social challenges”	2023	Journal	Industry and Innovation

AUTHOR	TITLE	Y.	TYPE	JOURNAL/BOOK
Xie et al.	Gender diversity in R&D teams and innovation efficiency: Role of the innovation context	2020	Journal	Research Policy
Zhao et al.	A blessing or a curse? Can digital economy development narrow carbon inequality in China?	2023	Journal	Carbon Neutrality
Zuev	Digital afterlife: (Eco)civilizational politics of the site and the sight of e-waste in China	2018	Journal	Anthropology Today

Table 12 Selected publications

Initial publications (2018–2020) explored the political and economic tensions between digitalisation and ecosystems. From 2021 onward, research increasingly examined the role of digital tools in achieving sustainable development and climate goals, highlighting both opportunities and risks. By 2023–2024, the emphasis moved toward people-centred and justice-oriented approaches, linking digitalisation with social inclusion, governance, and indicators for monitoring fair transitions. The word cloud (Figure 7) highlights that the most recurrent topics in the papers revolve around the intersection of digital, social, and economic dimensions. These topics are accompanied by other recurrencies related to geographical dimentions, such as European and country. It is significant that concepts like gender and women are also prominently emerging in the literature as indicators of gender peculiarities and divides.

Figure 7 Green and digital nexus publications word cloud

Methodologies adopted by the selected publications (Table 13) are Theoretical analysis (29.4%), Survey (23.5%), Econometric analysis (17.6%), Literature review (17.6%) and Case study analysis (11.8%).

METHODOLOGIES	RECURRENCIES
THEORETICAL ANALYSIS	29.4%
SURVEY	23.5%
LITERATURE REVIEW	17.6%
ECONOMETRIC ANALYSIS	17.6%
CASE STUDY ANALYSIS	11.8%

Table 13 Methodologies adopted

2.4.2. EU funded projects review

Through CORDIS search, 32 EU-funded projects were identified under the *Green and digital nexus* topic. After the screening, a total of 13 projects were selected for detailed analysis (Annex 1). Of these, 23% were funded through the Horizon 2020 programme, while 77% under Horizon Europe. Selected projects start date is concentrated between 2022 and 2025 (85% in total) with peaks in 2023 (23%) and 2024 (31%) (Figure 8). Project coordinators are predominantly based in Germany, Italy and Spain (all 15.4%).

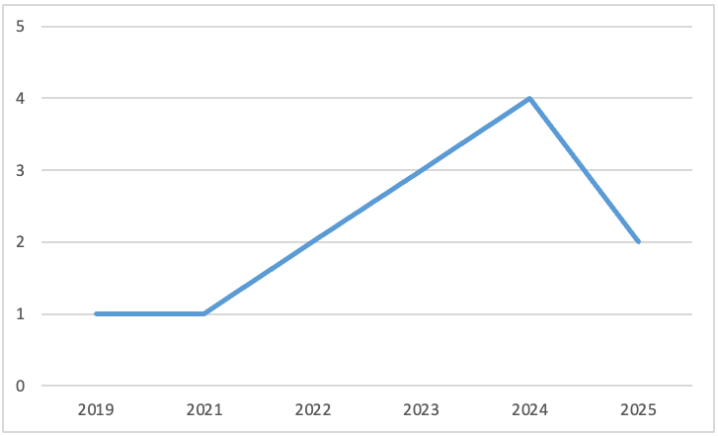

Figure 8: Green and digital nexus projects' start year distribution during time

In 2022, projects began by linking digitalisation to climate goals through participatory governance and democratic innovation. By 2023–2024, the focus expanded to include skills development, AI adoption in small enterprises, and equitable access to digital infrastructures, with growing concern for social inclusion and capacity-building. Projects starting in 2025 signal a more systemic turn, emphasising cross-sector integration, data-driven foresight, and the reduction of digital and territorial divides in pursuit of a just transition.

2.4.3. Content analysis and narrative summary

Emerging literature on *Green and digital nexus* reflects a growing recognition of the need to understand how digitalisation and environmental sustainability interact across economic, institutional, and social domains. Recent research on reflects a shift from viewing these as purely technological processes to understanding them as socio-economic transformations. Three interrelated research lines have been identified.

The first one concerns the unequal social and territorial distribution of opportunities and risks associated with digital transition. Studies such as those by Lopez-Sintas et al. (2020) and Kaddour and Ghbara (2023) explore how the

uneven rollout of digital infrastructures and environmental technologies can reinforce existing disparities across gender, socio-economic status, and geography. These inequalities are reflected not only in access to digital tools but also in disparities in digital literacy, trust in technology, and the capacity of individuals and communities to shape digital implementation. Bianchi et al. (2024) argue for a “triple transition” that integrates digital, green, and skills development strategies, calling for territorially sensitive education and training initiatives capable of addressing both structural and place-based inequalities. The literature increasingly points to the need for intersectional approaches that account for overlapping forms of exclusion, particularly for marginalised groups in rural and economically vulnerable regions, demonstrating that digital and green strategies, if uncritically deployed, may reproduce or exacerbate systemic injustices rather than resolve them. In fact, they explicitly frame the transition as not just digital and green, but also a "skills transition." They argue that fairness in the transformation process requires investment in education and vocational training that matches regional socio-economic conditions.

A second research line examines the productive and technological potential of digitalisation in accelerating ecological transformation, particularly in industry, energy, and resource-intensive sectors. A growing number of studies analyse how digital platforms, AI, blockchain, and IoT contribute to the decarbonisation of supply chains, optimisation of resource flows, and adoption of circular economy principles (Dabbous et al., 2023; Fan et al., 2023; Elkady et al., 2024). These contributions often focus on firm-level innovation, emphasising the role of digital solutions in increasing environmental efficiency. Mondejar et al. (2021), in a comprehensive literature review, provide a synthesis of the environmental implications of digitalisation, identifying both enabling mechanisms and unintended ecological consequences such as rebound effects and increased energy consumption associated with data infrastructures. Several studies note that the benefits of technological innovation are contingent on supportive regulatory frameworks, institutional coordination, and alignment with broader transition goals.

A third line of research addresses the governance challenges associated with managing the convergence of green and digital agendas. Scholars highlight the need for multilevel, cross-sectoral governance frameworks that can steer complex transformations while ensuring equity, transparency, and legitimacy. Canesi and Marella (2023) argue that digitalisation processes are reshaping urban and regional policy regimes, necessitating new sustainability indicators and governance models, particularly in structurally weaker territories. They emphasise the need for territorial responsiveness to prevent digitalisation from deepening fragmentation in already marginalised areas. Timmermans et al. (2023) emphasise the labour market impacts of digital and green transformations, arguing that policies must support workers at risk of exclusion—especially those in regions or sectors lagging behind. This includes targeted training, employment support, and governance reforms to manage uneven territorial effects. These studies consistently argue that the effectiveness and

legitimacy of the transition depend not only on technological integration but also on the institutional capacity to manage its socio-economic complexity. Governance is thus not simply a procedural concern, but a constitutive dimension of digital transition, shaping its distributional outcomes and social legitimacy.

Based on the comparison between the literature and the EU-funded projects, several important connections and some divergences can be observed. The reviewed projects engage with many of the key challenges and research directions identified in the literature, particularly concerning equity, institutional coordination, and skills. However, some dimensions remain less addressed.

Several projects clearly respond to the first line of research identified in the literature, which focuses on the unequal distribution of risks and opportunities. The project READJUST is particularly relevant, as it explicitly addresses the social implications of both transitions and highlights the need for inclusive governance models. It engages directly with issues of representation, participation, and justice, especially for vulnerable groups and disadvantaged territories. Similarly, REAL DEAL and DeCrises adopt participatory and deliberative approaches, aiming to integrate citizen perspectives into both climate and digital governance. These projects align with the literature's concern about the risks of reinforcing structural inequalities through uneven technological rollout and limited digital access, and they recognise the need for intersectional and locally grounded responses.

The second line of research identified in the literature concerns the productive and technological potential of digitalisation to support transformation. This area is less prominently represented among the reviewed projects, though some initiatives do contribute. MariTech Talent, for example, promotes digital and green skill development in the maritime technology sector and aims to align training with future ecological and digital demands. While the project touches on environmental efficiency and sectoral transition, it primarily addresses workforce development and human capital rather than directly investigating digitalisation's ecological consequences or its optimisation potential in industrial systems. The broader question of how AI, IoT, or data platforms might support circular economy practices, reduce emissions, or streamline resource use - central in the literature - is not yet systematically addressed by projects.

The third research line relates to the governance of green and digital transitions, particularly how institutions manage complex, cross-sectoral transformations. The reviewed projects show a growing awareness of this challenge. READJUST, for example, reflects on the need to improve policy coordination to avoid fragmented strategies and to make sure transition policies respond to territorial and socio-economic differences. DeCrises further explores how policy responses evolve under the pressure of crises and seeks to understand the institutional adaptations required to steer transitions more inclusively. While these projects contribute to a better understanding of governance dynamics, the literature's call for comprehensive multi-level frameworks and long-term institutional learning

strategies is only partially addressed. Moreover, the issue of labour market exclusion and the need for regionally adapted employment support - highlighted in the literature - remains underdeveloped across the project set.

Taken together, these EU-funded projects reflect different degrees of alignment with the themes emerging from the literature on the green and digital nexus. There is a clear commitment to addressing territorial and social disparities, particularly by targeting digital exclusion, improving access to skills, and promoting participatory approaches to governance. Many initiatives demonstrate awareness of the need to align environmental, digital, and social goals, often through practical tools for capacity-building and stakeholder engagement. However, some divergences remain. The environmental consequences of digitalisation—such as increased energy demand, resource use, or rebound effects—are rarely considered in project design. In addition, while governance is frequently framed in terms of inclusion, few projects propose broader institutional arrangements or long-term coordination mechanisms that can manage the cross-sectoral and multi-level complexity of the green-digital transition. This suggests that, although important steps have been taken, a more integrated and systemic approach is still needed.

3. Discussion

The analysis of literature and EU-funded projects across the four key topics – i) *Conceptualisation of Fairness, ii) Climate Policy Instruments and Frameworks, iii) Systemic Design Approaches,* and iv) *Green and Digital Nexus* - reveals important advancements in how just transition is being conceptualised and implemented. Across all topics, a move is evident from fragmented or sector-specific approaches toward integrated strategies that connect environmental objectives with social and territorial considerations. This direction reflects the ambition of the **European Green Deal**, the **Clean Industrial Deal**, and the EU's target of achieving **climate neutrality by 2050**. However, several mismatches remain between what is being explored in research and what is emerging from EU-funded projects, particularly when it comes to addressing long-term inequalities, policy coherence and multilevel governances, and the ability to adapt strategies to different local conditions.

In relation to *Conceptualisation of fairness*, both academic contributions and projects acknowledge its multiple dimensions, including distributional, procedural, intergenerational, and territorial aspects. However, many projects still avoid addressing long-standing drivers of exclusion, such as historical injustices or uneven development paths. While inclusion and participation are increasingly integrated into project design, the analysis shows that more work is needed to understand how equity goals are applied across policy domains and how they are shaped by broader economic and political structures. Future research should

deepen the understanding of how fairness can inform institutional frameworks and how responsibilities and resources are shared across groups and territories.

On *Climate policy instruments and frameworks*, the trend is toward policies that not only reduce emissions but also consider their wider effects on households, workers, and regions. Many projects develop tools for policy evaluation, behavioural change, and long-term planning. Still, relatively few provide insights into how different social groups experience the impacts of these instruments, or how compensation mechanisms are designed and implemented. There is limited attention to the role of labour markets and income diversity in shaping responses to policy. The public discussion around distributional effects and the communication of benefits remains underdeveloped. In a context of increasing public scepticism toward climate policies, this represents a major area for further investigation.

Systemic design approaches are increasingly used to support collaboration among stakeholders, manage complexity, and link local experimentation with strategic planning. Design is viewed not only as a method for creating solutions but also to organise shared processes, anticipate barriers, and link action across different sectors. Many projects demonstrate strong interest in this direction, especially in urban systems, food transitions, and mobility. However, only a few invest in new professional profiles, learning pathways, or public-sector capabilities that would allow these approaches to become more widely adopted. Expanding knowledge and practical know-how in this area remains a priority.

In the field of *Green and digital nexus*, projects have started to address the risks of unequal access to infrastructure, digital tools, and skills. Some also explore the potential of data and digital applications to enhance resource use and local resilience. Yet, the environmental impacts of digitalisation - such as energy use and material demand - are rarely assessed, and the coordination between digital and green agendas often remains limited. There is a growing need to better understand how digitalisation reshapes employment, participation, and decision-making, especially in regions that already face structural challenges.

A cross-cutting challenge concerns the absence of shared methods to assess who benefits from or is disadvantaged by transition policies. While many projects reference equity and inclusion, few provide indicators capable of capturing how impacts evolve over time or differ across territories. Existing assessments are often limited to specific policy sectors and rarely examine the interactions and trade-offs between social, environmental, and economic objectives. This limits the ability of policymakers to understand combined effects or unintended outcomes, particularly in areas already facing long-term structural difficulties. Since climate transition involves interconnected systems and overlapping policy domains, it is essential to develop integrated evaluation frameworks that reflect these dynamics and support more coherent and balanced decision-making.

This is closely connected to two broader priorities: strengthening institutional capacity and expanding access to knowledge on new approaches and technologies. As transitions become increasingly complex and require action across different levels of governance, public administrations - especially at the local level - must be equipped to interpret evidence, coordinate across sectors, and engage a wide range of stakeholders. At the same time, there is a clear need to improve access to practical knowledge and applied expertise related to innovative instruments, digital applications, and systemic planning tools. Responding to these needs requires dedicated investment in training, peer exchange, and collaborative learning to reinforce the ability of institutions and actors to contribute meaningfully to the design and implementation of fair and effective transition strategies.

Building on emerging directions identified across the four topics, a set of research lines should be prioritised for the Strategic Research and Innovation Agenda. These areas respond to the changing landscape of climate policy and support the goal of delivering a just, effective, and territorially balanced transition in line with the EU's climate commitments.

- **Geopolitical shifts and access to resources**: with growing competition over strategic materials, research is needed on how global dynamics affect the supply of key components for digital and green infrastructure. This includes identifying alternatives to high-impact or high-cost materials and improving circular and local approaches to production and reuse.

- **Public trust and resistance to transition policies**: The increasingly polarised debate around the European Green Deal highlights the need for a systematic investigation of how climate policies are perceived across different social and territorial contexts. It is essential to develop methodological approaches to measure, explain, and communicate the direct and indirect benefits of climate action in ways that are empirically robust, intelligible, and socially meaningful. Research activities should aim to generate reliable scientific evidence capable of addressing forms of opposition rooted in unfounded fears, misinformation, or vested interests. Providing evidence-based responses to these forms of resistance is crucial for strengthening public support and the democratic legitimacy of ecological transition policies.

- **Asymmetric industrial and territorial impacts of transition policies**: Climate policies entail both challenges and opportunities for different economic sectors and territorial contexts. Research should adopt a territorial and sector-specific approach to examine how to support regions and workers most affected by industrial transformation, while also identifying areas where new opportunities may arise. The ecological transition does not produce uniform effects; its impacts vary according to territorial and productive contexts. Research should therefore focus on analysing and designing policies, instruments, and operational processes

that can effectively support these transformations. This includes mechanisms for employment reallocation and targeted sectoral investment strategies. It is crucial to develop concrete pathways to mitigate adverse impacts and steer the transition in a fair, inclusive, and territorially grounded manner.

- **The role of AI and digital tools**: the use of artificial intelligence in planning, modelling, and governance is expanding. More research is needed on how these technologies affect policy delivery, public participation, and labour markets. Special attention should be paid to new training needs and to the conditions required to ensure inclusive digital governance.

- **New approaches to financing**: mobilising private capital is essential to complement public investment. Research should explore how new financial tools—such as green bonds or outcome-based financing—can be aligned with social and environmental goals, and how they can be used to support small-scale or community-led initiatives.

- **Improving coordination across governance levels**: one major research need concerns how to align actions across institutions and across territories. Research should help identify how to improve coherence between national goals and local implementation, clarify responsibilities, and support long-term planning. This also means investing in knowledge on how to design strategies that respond to specific territorial features and needs.

- **Instruments for local implementation**: there is a clear need for research that supports the identification and testing of innovative policy instruments for use at the local level, to involve multiple public and private stakeholders. These instruments should be designed to improve the delivery of national climate goals coupled with local priorities.

- **Integrated impact evaluation**: fair transition policies generate a wide range of impacts that cut across environmental, social, and economic dimensions. Research should focus on the development of frameworks capable of capturing these multiple effects in a systematic way. This includes identifying co-benefits and trade-offs between different types of impacts, and supporting more informed, transparent, and coherent decision-making across sectors and governance levels.

- **Spatial justice:** although it has emerged only marginally in current debates, spatial justice is a critical dimension of fair transition. Research should explore how place-based inequalities - such as energy poverty, vulnerability, and exposure to environmental risks - affect individuals and communities differently, even within the same urban or regional context. Addressing these intra-territorial disparities is essential to prevent new

forms of exclusion and to design transition strategies that are equitable not only across regions but also within them.

- **Institutional capacity and adaptation**: finally, more research is needed on how public institutions can adapt their structures, routines, and decision-making processes to respond to long-term climate and digital challenges. This includes the design of flexible governance tools, mechanisms for learning and feedback, and new roles for public authorities at regional and local levels.

Annex I: EU-funded project

Topic 1 – Conceptualisation of fairness

FP	ID	Acronym	Title	Master Call	Start
HORIZON EUROPE	101081358	ACCREU	Assessing Climate Change Risk in EUrope	HORIZON-CL5-2022-D1-01-two-stage	2023
HORIZON EUROPE	101069880	AdJUST	Advancing the understanding of challenges, policy options and measures to achieve a JUST EU energy transition	HORIZON-CL5-2021-D2-01	2022
HORIZON	101181568	BioFairNet	Bioeconomy and Circular Economy Fair Network Digitally fair and accessible network for reducing GHG activities with circular and bio-economy models	HORIZON-CL6-2024-CIRCBIO-01	2025
HORIZON EUROPE	101059662	BIONEXT	The Biodiversity Nexus: transformative change for sustainability	HORIZON-CL6-2021-BIODIV-01	2022
HORIZON EUROPE	101069586	BOLSTER	Bridging Organizations and marginalized communities for Local Sustainablity Transitions in EuRope	HORIZON-CL5-2021-D2-01	2022
H2020	884539	CINTRAN	Carbon Intensive Regions in Transition - Unravelling the Challenges of Structural Change	H2020-LC-SC3-2018-2019-2020	2020
HORIZON EUROPE	101087022	COALition	Promoting Innovation Excellence in Transformation of Coal Regions to Climate-Neutral, Thriving Economies	HORIZON-WIDERA-2022-ACCESS-04	2023
HORIZON	101084220	COEVOLVERS	Coevolutionary approach to unlock the transformative potential of nature-based solutions for more inclusive and resilient communities	HORIZON-CL6-2022-COMMUNITIES-01	2022
HORIZON EUROPE	101056873	ELEVATE	ENABLING AND LEVERAGING CLIMATE ACTION TOWARDS NET-ZERO EMISSIONS	HORIZON-CL5-2021-D1-01	2022
H2020	101036534	FIRELOGUE	Cross-sector dialogue for Wildfire Risk Management	H2020-LC-GD-2020	2021
H2020	101037031	FRONTSH1P	A FRONTrunner approacTransition to a circular & resilient future: deployment of systemic solutions with the support of local clusters and the development of regional community-based innovation schemes	H2020-LC-GD-2020	2021
H2020	101003656	FULFILL	Fundamental Decarbonisation Through Sufficiency By Lifestyle Changes	H2020-LC-CLA-2018-2019-2020	2021
HORIZON	101094326	gEneSys	Transforming Gendered Interrelations of Power and Inequalities for Just Energy Systems	HORIZON-CL2-2022-TRANSFORMATIONS-01	2023

FP	ID	Acronym	Title	Master Call	Start
H2020	101025998	GRETA	Ground-breaking Research on Employment and Environmental Transitions Ahead	H2020-MSCA-IF-2020	2021
HORIZON EUROPE	101178623	Just Fashion	Supporting the Just transition for the Fashion sector	HORIZON-CL2-2024-HERITAGE-01	2024
HORIZON	101101469	JUST-GREEN AFRH2ICA	Promoting a JUST transition to GREEN hydrogen in AFRICA	HORIZON-JTI-CLEANH2-2022-1	2023
H2020	101003491	JUST2CE	A JUST TRANSITION TO THE CIRCULAR ECONOMY	H2020-SC5-2018-2019-2020	2021
H2020	101003757	JUSTNature	Activation of NATURE-based solutions for a JUST low carbon transition	H2020-LC-CLA-2018-2019-2020	2021
H2020	869327	JUSTNORTH	Toward Just, Ethical and Sustainable Arctic Economies, Environments and Societies	H2020-LC-CLA-2018-2019-2020	2020
HORIZON EUROPE	101183367	NEWPATHWAYS	NEW PATHWAYS FOR EQUITABLE CLIMATE ACTION IN LINE WITH THE PARIS AGREEMENT AND SUSTAINABLE DEVELOPMENT	HORIZON-CL5-2024-D1-01	2025
HORIZON	101093873	R4C	Regions4Climate	HORIZON-MISS-2021-CLIMA-02	2023
HORIZON EUROPE	101132562	READJUST	Just transition to a green and digital future for all	HORIZON-CL2-2023-TRANSFORMATIONS-01	2024
H2020	101037071	REAL DEAL	Reshaping European Advances towards green Leadership Through Deliberative Approaches and Learning	H2020-LC-GD-2020	2022
H2020	727097	RELOCAL	Resituating the local in cohesion and territorial development	H2020-SC6-REV-INEQUAL-2016-2017	2016
HORIZON EUROPE	101069653	TANDEM	Transdisciplinary ANd Deliberative equity appraisal of transition policies in Energy and Mobility	HORIZON-CL5-2021-D2-01	2022
H2020	836819	TRACER	Smart strategies for the transition in coal intensive regions	H2020-LC-SC3-2018-2019-2020	2019

Topic 2 - Climate policy instruments and frameworks

FP	ID	Acronym	Title	Master Call	Start
H2020	688995	Waste4Think	Moving towards Life Cycle Thinking by integrating Advanced Waste Management Systems	H2020-WASTE-2014-2015	2016
ERC	725525	FINEPRINT	Spatially explicit material footprints: fine-scale assessment of Europeâ€™s global environmental and social impacts	ERC-2016-COG	2017
H2020	847101	EERAdata	Data-driven decision-support to increase energy efficiency through renovation in European building stock.	H2020-LC-SC3-2018-2019-2020	2019
HORIZON EUROPE	101112305	GREENPATHS	GREEN-PATHS: European Knowledge Hub On Just Transition Pathways	HORIZON-CL2-2022-TRANSFORMATIONS-02	2023
HORIZON EUROPE	101131544	STUDIES-DIG	Models and Instruments for Transforming Higher Education Systems through Transnational Multi-Sector Links	HORIZON-MSCA-2022-SE-01	2024
HORIZON EUROPE	101188188	SoGreen	Social Aspects of the Green Transition (SoGreen)	HORIZON-INFRA-2024-TECH-01	2025
H2020	862739	MOVING	Mountain Valorization through Interconnectedness and Green Growth	H2020-RUR-2018-2020	2020
H2020	730497	NAIAD	NAture Insurance value: Assessment and Demonstration	H2020-SC5-2016-2017	2016
H2020	634495	MINOUW	Science, Technology, and Society Initiative to minimize Unwanted Catches in European Fisheries	H2020-SFS-2014-2015	2015
HORIZON EUROPE	101091483	CIRAN	CrItical RAw materials extraction in enviroNmentally protected areas	HORIZON-CL4-2022-RESILIENCE-01	2023
H2020	882986	ITFLOWS	IT tools and methods for managing migration FLOWS	H2020-SU-SEC-2018-2019-2020	2020
HORIZON EUROPE	101061288	SCIREARLY	POLICIES AND PRACTICES BASED ON SCIENTIFIC RESEARCH FOR REDUCING UNDERACHIEVEMENT AND EARLY SCHOOL LEAVING IN EUROPE	HORIZON-CL2-2021-TRANSFORMATIONS-01	2022
HORIZON EUROPE	101093968	RESIST	Regions for climate change resilience through Innovation, Science and Technology	HORIZON-MISS-2021-CLIMA-02	2023
H2020	773330	GAIN	Green Aquaculture Intensification in Europe	H2020-SFS-2016-2017	2018
H2020	726755	CITADEL	Empowering Citizens to TrAnsform European PubLic Administrations	H2020-SC6-CULT-COOP-2016-2017	2016

FP	ID	Acronym	Title	Master Call	Start
H2020	776816	Project O	Project Ã”: demonstration of planning and technology tools for a circular, integrated and symbiotic use of water	H2020-IND-CE-2016-17	2018
HORIZON EUROPE	101132586	MTSS-K	Early identification and remediation of literacy, numeracy, and social-emotional difficulties in kindergarten: an examination of the efficacy of a multi-tiered system of support (MTSS)	HORIZON-CL2-2023-TRANSFORMATIONS-01	2024
HORIZON EUROPE	101094652	DIGNITYFIRM	Dignity For Irregular Migrants in EU Farm2Fork Labour Markets	HORIZON-CL2-2022-TRANSFORMATIONS-01	2023
H2020	846707	HIROSS4all	HOME INTEGRATED RENOVATION ONE-STOP-SHOP FOR VULNERABLE DISTRICTS	H2020-LC-SC3-2018-2019-2020	2019
H2020	677622	SIMRA	Social Innovation in Marginalised Rural Areas	H2020-ISIB-2014-2015	2016
HORIZON EUROPE	1,01E+08	CAPABLE	ClimAte Policy AcceptaBiLity Economic framework	HORIZON-CL5-2021-D1-01	2023
HORIZON EUROPE	870245	GEOCEP	Global Excellence in Modelling Climate and Energy Policies	H2020-MSCA-RISE-2019	2022
H2020	889385	ENPOR	Actions to Mitigate Energy Poverty in the Private Rented Sector	H2020-LC-SC3-2018-2019-2020	2020
ERC	865181	HEAL	Health, Labor and Environmental Regulation in Post-Industrial Europe	ERC-2019-COG	2020
H2020	776661	SOCLIMPACT	DownScaling CLImate imPACTs and decarbonisation pathways in EU islands and enhancing socioeconomic and non-market evaluation of Climate Change for Europe, for 2050 and beyond.	H2020-SC5-2016-2017	2017
H2020	703399	ROBUST POLICY	Developing a robust decision-making framework for climate change policy under uncertainty	H2020-MSCA-IF-2015	2016
H2020	730459	EUCalc	EU Calculator: trade-offs and pathways towards sustainable and low-carbon European Societies	H2020-SC5-2016-2017	2016

Topic 3 – Systemic design approaches

FP	ID	Acronym	Title	Master Call	Start
H2020	841291	ACTION	Assessing Climate TransItion OptioNs: policy vs impacts	H2020-MSCA-IF-2018	2020

FP	ID	Acronym	Title	Master Call	Start
HORIZON EUROPE	101069880	AdJUST	Advancing the understanding of challenges, policy options and measures to achieve a JUST EU energy transition	HORIZON-CL5-2021-D2-01	2022
HORIZON EUROPE	101084220	COEVOLVERS	Coevolutionary approach to unlock the transformative potential of nature-based solutions for more inclusive and resilient communities	HORIZON-CL6-2022-COMMUNITIES-01	2022
H2020	101033778	crossCert	Cross Assessment of Energy Certificates in Europe	H2020-LC-SC3-2018-2019-2020	2021
H2020	784979	EeDaPP	Energy efficiency Data Protocol and Portal	H2020-EE-2016-2017	2018
H2020	821471	ENGAGE	Exploring National and Global Actions to reduce Greenhouse gas Emissions	H2020-LC-CLA-2018-2019-2020	2019
HORIZON EUROPE	101181470	EPIC-SHIFT	Securing Holistic and Impactful Food Systems Transformation with Novel Foods based on alternative proteins	HORIZON-CL6-2024-FARM2FORK-01	2024
HORIZON EUROPE	101060536	FEAST	FEAST	HORIZON-CL6-2021-FARM2FORK-01	2022
HORIZON EUROPE	101136749	FEASTS	Fostering European cellular Agriculture for Sustainable Transition Solutions	HORIZON-CL6-2023-FARM2FORK-01	2023
H2020	101036534	FIRELOGUE	Cross-sector dialogue for Wildfire Risk Management	H2020-LC-GD-2020	2021
H2020	101037031	FRONTSH1P	A FRONTrunner approacTransition to a circular & resilient future: deployment of systemic solutions with the support of local clusters and the development of regional community-based innovation schemes	H2020-LC-GD-2020	2021
HORIZON EUROPE	101112305	GREENPATHS	GREEN-PATHS: European Knowledge Hub On Just Transition Pathways	HORIZON-CL2-2022-TRANSFORMATIONS-02	2023
HORIZON EUROPE	101130954	HiCon	Highly Efficient Reactor for Conversion of CO2 and H2O to Carbon Neutral Fuels and Chemicals	HORIZON-EIC-2023-PATHFINDEROPEN-01	2023
HORIZON EUROPE	101133847	INAIR	INcreasing the uptake of AI technology in Retail	HORIZON-CL4-2023-HUMAN-01	2021
H2020	821124	NAVIGATE	Next generation of AdVanced InteGrated Assessment modelling to support climaTE policy making	H2020-LC-CLA-2018-2019-2020	2019

FP	ID	Acronym	Title	Master Call	Start
H2020	820846	PARIS REINFORCE	Delivering on the Paris Agreement: A demand-driven, integrated assessment modelling approach	H2020-LC-CLA-2018-2019-2020	2019
HORIZON EUROPE	101103924	REALLOCATE	Rethinking the dEsign of streets And pubLic spaces to Leverage the mOdal shift to Climate-friendly Active Transport Everywhere	HORIZON-MISS-2022-CIT-01	2023
HORIZON EUROPE	101136011	SETS	Social Economy Transition Skills	HORIZON-CL4-2023-HUMAN-01	2024
H2020	862448	SHERPA	Sustainable Hub to Engage into Rural Policies with Actors	H2020-RUR-2018-2020	2019
HORIZON EUROPE	101069529	SSH CENTRE	Social Sciences and Humanities for Climate, Energy aNd Transport Research Excellence	HORIZON-CL5-2021-D2-01	2022
H2020	774094	STARDUST	HOLISTIC AND INTEGRATED URBAN MODEL FOR SMART CITIES	H2020-SCC-2016-2017	2017
HORIZON EUROPE	101069653	TANDEM	Transdisciplinary ANd Deliberative equity appraisal of transition policies in Energy and Mobility	HORIZON-CL5-2021-D2-01	2022
H2020	727243	VALUMICS	Understanding food value chains and network dynamics	H2020-SFS-2016-2017	2017

Topic 4 – Digital and climate nexus

FP	ID	Acronym	Title	Master Call	Start
HORIZON EUROPE	101136011	SETS	Social Economy Transition Skills	HORIZON-CL4-2023-HUMAN-01	2024
HORIZON EUROPE	101132562	READJUST	Just transition to a green and digital future for all	HORIZON-CL2-2023-TRANSFORMATIONS-01	2024
H2020	101037071	REAL DEAL	Reshaping European Advances towards green Leadership Through Deliberative Approaches and Learning	H2020-LC-GD-2020	2022
HORIZON EUROPE	101135888	MariTech Talent	MariTech Talent Programme	HORIZON-CL4-2023-HUMAN-01	2023
HORIZON EUROPE	101177807	DeCrises	EU Decarbonisation in Times of Crises: Exploring Social Innovations and Enhancing an Equitable Twin Transition	HORIZON-CL2-2024-DEMOCRACY-01	2025
HORIZON EUROPE	101133847	INAIR	INcreasing the uptake of AI technology in Retail	HORIZON-CL4-2023-HUMAN-01	2024

FP	ID	Acronym	Title	Master Call	Start
HORIZON EUROPE	101181568	BioFairNet	Bioeconomy and Circular Economy Fair Network Digitally fair and accessible network for reducing GHG activities with circular and bio-economy models	HORIZON-CL6-2024-CIRCBIO-01	2025
HORIZON EUROPE	101069529	SSH CENTRE	Social Sciences and Humanities for Climate, Energy aNd Transport Research Excellence	HORIZON-CL5-2021-D2-01	2022
HORIZON EUROPE	101132673	TRAILS	Enabling data analytics for actions tackling skills shortages & mismatch	HORIZON-CL2-2023-TRANSFORMATIONS-01	2024
HORIZON EUROPE	101095912	COBIOE	GROWING CONNECTION FOR BIO ECOSYSTEMS	HORIZON-EIE-2022-CONNECT-01	2023
H2020	821124	NAVIGATE	Next generation of AdVanced InteGrated Assessment modelling to support climaTE policy making	H2020-LC-CLA-2018-2019-2020	2019
HORIZON EUROPE	101112305	GREENPATHS	GREEN-PATHS: European Knowledge Hub On Just Transition Pathways	HORIZON-CL2-2022-TRANSFORMATIONS-02	2023
H2020	101037031	FRONTSH1P	A FRONTrunner approacTransition to a circular & resilient future: deployment of systemic solutions with the support of local clusters and the development of regional community-based innovation schemes	H2020-LC-GD-2020	2021

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PART II - Zuzana Harmáčková

4. Assessment approach

The summary builds on current publications drawing from the fields of sustainability science, science and technology studies (STS), political ecology, environmental studies, and science-policy interface studies. A combination of peer-reviewed publications, science-policy reports and the deliverables and outputs of selected Horizon 2020 and Horizon Europe projects were used as data sources. The approach to identify and synthesize the insights is outlined in the following sections.

4.1. Peer-reviewed publications

Peer-reviewed publications were identified through a keyword-based search complemented by snowball sampling of articles, with the following parameters of the searches:

- Search engine: Clarivate Analytics Web of Science
- Search language(s): English
- Date: November 2024 – March 2025
- Timespan: 2015-2025
- Search terms: *"(social OR societal) AND (transformation AND transition) AND sustainability"* combined with:
    - Section Attitudes, values, and lifestyles:
        - *values AND (policy OR governance OR decision-making OR value-action gap OR deliberation OR participation OR justice)*
        - *(lifestyle OR consumption) AND (norms OR behaviour OR change)*
    - Section Building trust and legitimacy
        - *trust AND (institution OR governance OR science)*
        - *inequality OR power*
        - *participation OR engagement*
        - *justice OR fairness*
        - *misinformation OR disinformation OR communication OR media*
    - Section Democratization of the green transition:
        - *democracy OR policy OR decision-making OR participation OR engagement OR deliberation OR bureaucracy OR*

governance OR justice OR distribution OR green economy OR inclusion OR marginalization

- *digital OR e-governance OR AI*
- *civil society OR grassroot OR movement OR community OR citizen OR local OR scaling OR power OR structural*

The searches retrieved 1174 publications in total, authored primarily by **a set of European universities and research institutes**, dominated by Western and Northern European institutes (Figure 9).

Figure 9. Key universities and institutes conducting research relevant to the search terms.

The list of researchers primarily contributing to the reviewed literature included authors listed in Table 14.

Researcher	% of articles in the sample
Frantzeskaki, Niki	1.444
Olsson, Per	1.189
Lang, Daniel	1.105
Geels, Frank	0.765
Wamsler, Christine	0.765
Wittmayer, Julia M.	0.68
Zscheischler, Jana	0.68
Moore, Michele-Lee	0.68
Luederitz, Christopher	0.595
Loorbach, Derk A	0.595
Lam, David	0.595
Schaepke, Niko A.	0.595
Feola, Giuseppe	0.51

Researcher	% of articles in the sample
Rosenbloom, Daniel	0.51
Stirling, Andy	0.51
Horcea-Milcu, Andra-Ioana	0.51
Bos, Joannette J. (Annette)	0.51
Rohracher, Harald	0.51
Pereira, Laura	0.51
El Bilali, Hamid	0.51
Schaltegger, Stefan	0.425
Folke, Carl	0.425
Trencher, Gregory	0.425
Avelino, Flor	0.425
Westman, Linda	0.425
Friedrich, Jonathan	0.425
Holscher, Katharina	0.425
Martin-Lopez, Berta	0.425
Tàbara, J. David	0.425
Williams, Stephen J.	0.34
Eakin, Hallie	0.34
Strassner, Carola	0.34
Weiser, Annika	0.34
Tukker, Arnold	0.34
Sovacool, Benjamin	0.34
Abson, David	0.34
Hestad, Dina	0.34
Tello, Enric	0.34
Broto, Vanesa Castan	0.34
Meadowcroft, J	0.34
Pahl-Wostl, Claudia	0.34
Bene, Chris	0.34
Pichler, Melanie	0.34
van Steenbergen, Frank S.	0.34
Westley, Frances R.	0.34
O'Brien, Karen	0.34
von Wehrden, Henrik	0.34
Rogge, Karoline S	0.34
Stauffacher, Michael	0.34
Scholz, Roland W.	0.34

Table 14. The top 50 most represented authors contributing to the reviewed literature (source: Web of Science).

The journals comprising the identified articles included Sustainability Science, Global Sustainability, Ecological Economics, Global Environmental Change, Environmental Science and Policy, Ecology and Society, Environmental Innovation and Societal Transitions, Technological Forecasting and Social Change, among many others.

The search results were scanned in iterative steps, including (1) title scan and filtering and (2) abstract scan and filtering. The filtered articles were synthesized with regard to (1) state of the art knowledge related to the fields of interest, and (2) related knowledge gaps and directions for further research.

4.2. Science-policy reports

Recent reports by major science-policy interfaces whose scope includes the issues of sustainability and justice were included among the synthesized materials, with particular attention to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and its highly relevant and comprehensive Methodological assessment report on the diverse values and valuation of nature (2022) and Thematic assessment report on the underlying causes of biodiversity loss and the determinants of transformative change and options for achieving the 2050 vision for biodiversity (2024).

4.3. Deliverables and outputs of Horizon 2020 and Horizon Europe projects

Deliverables and outputs from recent Horizon 2020 (H2020) and Horizon Europe (HE) projects were analysed to assess how Horizon funding has contributed to the state of the art – highlighting well-covered subthemes as well as areas with lower coverage.

A complete list of H2020 and HE projects was downloaded from the CORDIS database, and filtered based on the core themes of the calls, specifically focusing on (1) H2020 and HE calls related to transformation, democracy, governance, co-creation and gender, (2) the H2020 Green Deal calls, and (3) HE Biodiversity calls related to transformative change. Only projects finishing prior to December 2025 were included in the analysis, based on the assumption that projects finishing afterwards have not had long enough span yet to deliver the bulk of their outputs. The resulting sample of projects was scanned based on their title and abstract, and relevant projects were reviewed to include in the state of the art analyses.

5. Integrative Themes

The current literature on transformative research (i.e. research focusing not only on gaining novel knowledge and understanding on societal transformation but also actively acting upon it) emphasises that the research filling in the gaps summarized in the following sections needs to embrace the following principles:

- To address the interconnected challenges of today (e.g. environmental, technological, social, geopolitical) in a **holistic, interdisciplinary** and **systems perspective**.
- To focus on **context-sensitive** and **adaptive** solutions, recognizing the different baseline conditions in different European regions.
- To prioritise an **equity** and **justice** lens, particularly with regard to **systemic inequalities** and **power imbalances**, which are foundational to ensuring that the benefits and burdens of sustainability transformation are distributed fairly.
- To nurture **transdisciplinary collaboration** between SSH, the natural sciences, policymaking, practitioners and civil society to bridge the gap between perspectives and knowledge systems and foster actionable solutions. Furthermore, research needs to be complemented by creating platforms for collaboration among academia, industry, civil society, and policymakers. These platforms can foster co-production of knowledge, thus ensuring that research outputs are actionable and directly inform sustainability policies.

6. Attitudes, values, and lifestyles

6.1. State of the art

6.1.1. The role of values and attitudes in social transformations

The most comprehensive review of research knowledge on the role of values and attitudes in social transformations currently available is the IPBES Methodological Assessment Report on the Diverse Values and Valuation of Nature (2022).

The report provides vast evidence showing that values influence individual and collective behaviour, policy decisions, and institutional structures, and can thus be leveraged to drive systemic change and shape societal transformations. While

the current global environmental crisis (biodiversity loss, climate change) is driven by dominant instrumental values that prioritize short-term economic gains over long-term sustainability, transformative change toward sustainability requires a shift from dominant economic and market-based values to broader sustainability-aligned values, such as justice, stewardship, and relational values, and their embedding in societal norms and policies (e.g. the HE Transpath project).

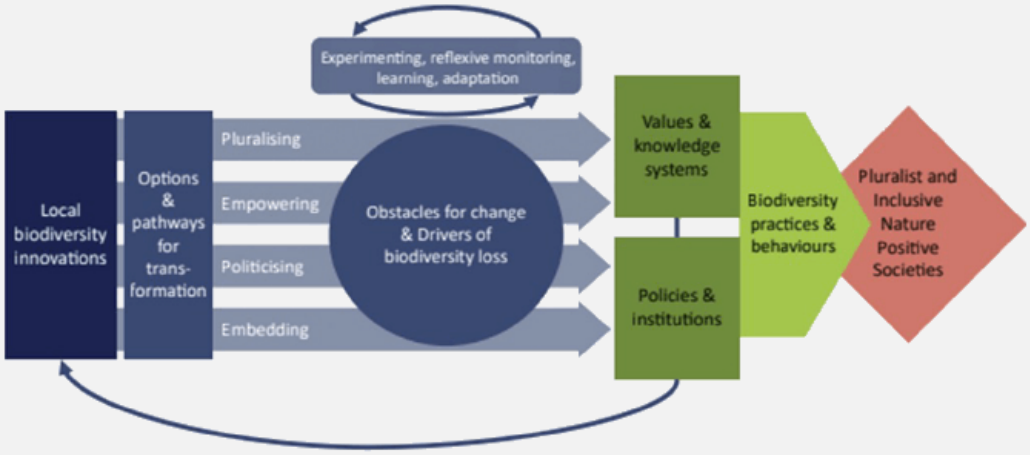
The evidence suggests that institutions and policies can either reinforce or challenge existing value structures. In this respect, it identifies four key leverage points to shift societal values toward sustainability: (1) recognizing the diversity of values (e.g., including local, indigenous, and non-market values) in decision-making; (2) embedding diverse values into decision-making (e.g., moving beyond GDP to well-being indicators, mainstreaming ecosystem service valuation), (3) reforming policies and governance systems to allow for a plurality of values to be recognized, and (4) shifting societal goals and norms (e.g., rethinking development beyond economic growth to well-being and planetary health, or emphasising the cultural development values – see e.g. the H2020 DISCE project).

Current research emphasises that values are not neutral; they are shaped by power dynamics and asymmetries, which may lead to exclusion of marginalized voices in governance. In this respect, research suggests that deliberative democratic processes (e.g., citizen assemblies, participatory valuation methods) can balance power and integrate diverse values into policies (e.g. the H2020 Real Deal and PHOENIX projects).

On the individual level, a significant challenge in sustainability transitions is the value-action gap, i.e. people may hold sustainability-aligned values but fail to act accordingly due to systemic constraints (e.g., economic pressures, social norms, policy barriers) (e.g. the HE BIOTraCes project, see Box 1). In this respect, behavioural interventions (e.g. education, incentive structures) are vital to bridge the gap between values and actions (e.g. the HE GreenScent and ECF4CLIM projects). In addition, policy alignment with societal values (e.g., promoting green consumption through regulations) is critical to reducing behavioural inertia. Importantly, narratives and cultural framing play a crucial role in shifting societal values over time.

Box 1. Operationalizing the link between sustainability-aligned values and systemic constraints in the BIOTraCes project.

The operation modus of the BIOTraCes project illustrates how the project actively acknowledges that values are mediated by potential systemic obstacles related to plurality, empowerment, political nature of change and embeddedness of change in the economy, social practices and policy.



Source: BIOTraCes

6.1.2. The role of lifestyles in social transformations

Lifestyles play a crucial role in sustainability transformations, as they encompass daily habits, social norms, and consumer choices that collectively determine resource use and environmental impact (e.g. the H2020 PSLifestyle project).

From a theoretical perspective, lifestyles comprise routines and behaviours which are shaped by broader social structures, cultural norms, and material conditions, rather than purely individual choices (e.g. the H2020 oPEN Lab project). This perspective highlights the role of systemic and infrastructural factors in reinforcing unsustainable behaviours and suggests that shifting these practices requires interventions at multiple levels of society (e.g. the H2020 ZeroW and ARV projects). In parallel, behavioural economics has provided another lens through which lifestyle change can be understood, emphasizing the role of nudges, incentives, and policy interventions in reshaping consumption behaviours. This approach suggests that altering the default settings of consumption – such as making plant-based diets the standard option in public institutions – can lead to substantial behavioural shifts without restricting individual freedoms (e.g. the H2020 SchoolFood4Change project). Additionally, the concept of transformative consumption has emphasised the importance of collective action, eco-conscious consumer identities, and activism in driving sustainable lifestyles when complementing policy and structural reforms. This perspective recognizes that lifestyle changes do not occur in isolation but are deeply embedded in cultural

and social movements that challenge existing economic and environmental paradigms. Thus, state-of-the-art research has illustrated that lifestyles can act as both barriers and catalysts for sustainability transformations, underscoring the need for integrated policy approaches that address both individual and structural dimensions of change.

Despite increasing awareness of sustainability challenges, significant structural and systemic barriers continue to impede large-scale lifestyle transformations (e.g. the HE Biotrails project). One of the most prominent obstacles is the persistence of lock-in effects, wherein existing infrastructures (e.g. urban planning models) reinforce unsustainable behaviours. For instance, car-dependent cities limit individuals' ability to transition to low-carbon mobility options, effectively making unsustainable transportation the default choice. Similarly, economic models that prioritize growth over sufficiency and well-being present another major barrier. Sustainability research has shown that the prevailing economic system incentivizes continuous consumption and expansion rather than promoting resource efficiency, circularity, or degrowth-oriented strategies that could foster more sustainable lifestyles (e.g. the H2020 FRONTSH1P project).

Social-science based sustainability research has illustrated that cultural and societal dynamics further complicate the transition. Social norms and aspirational culture frequently reinforce high-consumption lifestyles, positioning material wealth, status-driven consumption, and convenience-based choices as desirable and socially rewarded behaviours. Even individuals who recognize the need for sustainability often experience behavioural gaps ("value-action gap", see above) in which personal attitudes and environmental awareness do not always translate into concrete behavioural changes. This disconnect is frequently exacerbated by external constraints such as financial limitations, lack of viable alternatives, or convenience-driven decision-making. Additionally, policy and governance gaps hinder progress by failing to provide adequate institutional support, incentives, or regulations that could facilitate sustainable lifestyle transitions. Weak or inconsistent policies on carbon pricing, waste management, and sustainable consumption create a fragmented policy landscape, making it difficult for individuals and businesses to systematically adopt lower-impact behaviours.

To address these barriers, several strategies have been proposed to facilitate systemic shifts toward sustainability-oriented lifestyles. Policy interventions can create economic incentives that encourage sustainable choices and penalize environmentally harmful behaviours. Additionally, social innovation plays a crucial role in enabling alternative models of living, such as co-housing arrangements, local food networks, and decentralized economic systems that emphasize community resilience and shared resources. Finally, behavioural nudges (e.g. setting plant-based meals as the default option in public institutions) can subtly influence choices and normalize sustainable behaviours without restricting individual freedoms. Research has been focusing on how to support these strategies through a combination of regulatory, social, and technological

interventions in order to realize inclusive and effective pathways toward sustainable lifestyles.

Relevant insights have been formulated also by critical fields incl. political ecology and sustainability-related SSHs, arguing that deep structural changes are needed instead of shallow policy tweaks and behavioural nudges. In this respect, these critical fields argue that the root causes of sustainability issues may be related to the principles of accumulation linked to capitalism, corporate influence, and historical inequalities, requiring a fundamental restructuring of economic and political systems rather than incremental reforms. Political ecology challenges the assumption that sustainability can be achieved within capitalist economic models, emphasizing that continuous growth and resource extraction are inherently unsustainable. Instead of market-based solutions like carbon pricing, political ecology scholars advocate for post-growth and degrowth paradigms, which prioritize sufficiency, redistribution, and alternative economic systems. In this understanding, high-consumption lifestyles are not merely social habits but are actively produced by corporations and economic elites through advertising, planned obsolescence, and financial incentives. Political ecology highlights that consumer culture is structurally imposed and calls for a politicization of sustainability discourse that examines who benefits from maintaining consumption-driven norms. In this respect, political ecology calls for redistributive policies and participatory governance, ensuring that sustainability transitions do not exacerbate social and economic inequalities (e.g. the HE SPES and ToBe projects). While technological solutions are often promoted as key to sustainability, political ecology warns against technological optimism that ignores extractivism supply chains, labour exploitation, and corporate control over innovation. Instead of relying on technology as a neutral fix, political ecology urges scrutiny of who controls, profits from, and bears the costs of new technologies in sustainability transitions (e.g. the HE WISE Horizon project).

6.2. Knowledge gaps

6.2.1. Enabling the actionability of sustainability-aligned values

Despite progress in behavioural science, we lack a deep understanding of how individuals, communities and organizations make decisions related to sustainability under varying socioeconomic and cultural conditions. In this respect, further research is needed to clarify the extent to which financial incentives, social norms, or intrinsic motivations like personal responsibility influence sustainable choices. With respect to individual values and behaviours and their structural enablers and disablers, the research agenda needs to focus on how formal and informal institutions, incentives and structural interventions

can better embrace sustainability-aligned values and how they can be mobilized to foster systemic change.

6.2.2. The role of culture, worldviews, practices and emotions

Promoting sustainable lifestyles requires transformation of the cultures these lifestyles are nested in. Importantly, research is needed into how different worldviews, cultural backgrounds and narratives shape collective values and behaviours that either promote or hinder sustainability, as the role of worldviews in driving sustainability transitions remains underexplored. Furthermore, as narratives and cultural symbols deeply influence collective behaviours and values, research needs to elucidate how art, literature, and media can play transformative roles by reshaping dominant narratives about growth, consumption, and progress, connect global sustainability challenges to local lived experiences while making them more relatable, and thus bridge the gap between awareness and action (e.g. the H2020 CreaTures project, the HE CRITICAL CHANGELAB project).

While current sustainability and transformation research has focused substantially on deeper levels of values and their role as “leverage points” for change, lesser attention has been paid to how everyday practices and individual/collective routines can facilitate or hamper value shifts and behavioural change towards sustainable and just outcomes.

Furthermore, the impact of emotions, such as fear of loss versus hope for a better future, on the engagement with sustainability and transformation issues deserves further study to design interventions that inspire long-term behaviour change.

In addition, we need to gain additional insights into how values oriented on sustainability, justice, care, empathy, trust and responsibility can be embedded in everyday life. This involves moving beyond policy-driven behaviour change to creating cultural shifts where sustainability, justice and equity becomes integral to identity and lifestyle. For instance, research needs to explore how deep-seated cultural norms (such as materialism and status consumption) can be shifted towards more sustainability-aligned values. In this respect, further research needs to address the interplay between social norms, values, and specific economic or geographic contexts across Europe and their role in fostering durable cultural change.

Finally, research needs to focus on how education, community-led initiatives, and cross-cultural exchanges can foster value and attitude shifts. At the same time, such research needs to be complemented by focusing on how bottom-up value shifts can be empowered by supportive policymaking across scales.

6.2.3. Structural change as the fundament for enacting values and attitudes

Further research is vital to clarify the limits of individual responsibility in achieving sustainability and where policy- and economy-related structural changes are required to reach sustainable and just futures – in other words, how to intertwine individual change with structural change. In this respect, research is urgently needed into the enablers and disablers of structural change (ranging from establishing physical infrastructure enabling sustainable lifestyles to establishing new economic models). Furthermore, more research is needed on whether tools focusing on individual pro-sustainability action without wider societal implications (e.g. eco-labelling, carbon footprint tracking or sustainability certification) empower citizens to nurture social-ecological transformations or reinforce individual responsibilization while lowering attention to the required structural changes.

6.2.4. Governance structures to enable representing different types of values

Future research needs to clarify how governance structures can be improved to increase institutional flexibility and enable bridging different types of values and their potential trade-offs across spatial, temporal, and administrative scales. In this respect, deeper insight is needed into institutional mechanisms that connect local, national, and global decision-making scales to align values across sectors such as conservation, development and business.

At the same time, a key research gap lies in the current lack of attention to power asymmetries and institutional constraints in representing different types of values, as decision-making processes and policy implementation frequently marginalize certain worldviews and knowledge systems, leading to social and environmental injustices. Such a marginalization can follow a number of axes, incl. geographical and regional marginalization (e.g. Eastern and Southeastern Europe, development models and socio-economic priorities may diverge from dominant Western European narratives), rural and remote areas (e.g. parts of Spain, Italy, France or Finland whose local knowledge, land-use practices, and rural livelihoods may be overlooked in urban-centric policy processes), peri-urban and post-industrial regions (which are often hit hardest by economic transitions, yet their priorities such as job security, identity, local regeneration, are underrepresented in green and innovation-driven policies), socio-economic groups (e.g. low-income communities and precarious workers in sectors like agriculture, transport, and manufacturing, where climate or conservation policies may conflict with economic survival, youth and elderly populations), and epistemically marginalised groups such (e.g. indigenous, local or traditional knowledge-holding communities, migrant and diasporic communities, Romani/Roma communities).

Thus, deeper insight is needed into how to mitigate power asymmetries within and between institutions, as these asymmetries shape which values are recognized and which are excluded from policy debates.

Further research is needed to understand how different types of valuation influence decision-making and policymaking, particularly how valuation results are integrated into policy and practice. In particular, there is a gap in identifying and evaluating best-practice policy tools that effectively incorporate values supporting sustainability and justice while driving transformative change.

6.2.5. Value and behavioural change in private sector

With respect to the behaviour of businesses and private sector organizations, it is crucial to understand how to motivate the shift in corporate behaviours in sustainability- and justice-aligned directions. In this respect, it is vital to elucidate which economic and policy incentives and tools can reshape the role of private sector organizations in sustainability transformations.

6.2.6. Sustainability values among young people

Although young people are often portrayed as strong advocates for sustainability action, there is a lack of nuanced research into the diversity of youth perspectives on sustainability transformations. While youth are often portrayed as a unified voice for sustainability, research has only begun to unpack the internal diversity of their perspectives, e.g. with respect to environmental values based on socioeconomic status, cultural background, political beliefs, and geographic location. Moreover, research has not fully explored the tensions between pro-sustainability values and the economic constraints younger generations face, such as precarious job markets and high living costs. More studies are needed on how young people reconcile their sustainability aspirations with their economic realities and how policies can better support their agency in driving systemic change.

6.2.7. Longitudinal research

While many projects have explored sustainability-related behaviours, most focus on short-term interventions rather than the deep cultural and social transformations required for a sustainable and just future. There is a lack of longitudinal studies tracking how values and behaviours evolve over time in response to policies, economic changes, or crises. Research tends to focus on immediate incentives rather than the structural conditions that enable sustained shifts in lifestyle choices, consumption habits, and environmental identities.

7. Building trust and legitimacy

7.1. State of the art

Trust and legitimacy are fundamental to the success of sustainability transformations, as they determine the extent to which individuals, communities, and institutions engage with and support sustainability-related policies and initiatives (e.g. the H2020 TiGRE and I-CHANGE projects). Contemporary research in sustainability science and related social sciences and humanities emphasizes that trust in governance, science, and institutions is not simply an outcome of effective policy implementation but a dynamic and context-dependent process shaped by historical, political, and socio-economic factors (e.g. the H2020 DEMOS and WorkYP projects). The presence or absence of trust has significant implications for the adoption of sustainability measures, particularly those that require public cooperation, behavioural change, or structural adjustments to economic and social systems (e.g. the HE ActEU project). Legitimacy, closely tied to trust, depends on whether governance processes are perceived as fair, transparent, inclusive, and effective (e.g. the H2020 URBANITE project). In cases where sustainability policies and their implementation fail to consider diverse perspectives and lived experiences, trust is undermined, leading to resistance, disengagement, or even active opposition to sustainability transitions (e.g. the H2020 UPLIFT and POPREBEL projects).

Empirical research highlights that trust in sustainability governance is often contingent upon perceptions of procedural justice, distributive justice, and recognition justice. Procedural justice refers to the fairness and inclusivity of decision-making processes, where public participation and transparency play a critical role. Distributive justice concerns the equitable distribution of benefits and burdens associated with sustainability policies, ensuring that marginalized communities do not bear disproportionate costs. Recognition justice extends this perspective by emphasizing the need to acknowledge and value different worldviews, especially of those communities whose knowledge systems have historically been sidelined in global sustainability discussions. The absence of justice-oriented governance structures has been shown to erode trust, reinforcing skepticism about sustainability transformations, particularly among groups that have experienced past injustices related to environmental policies or, importantly, economic transitions (e.g. the H2020 TiGRE project).[1]

Trust in science is another crucial element influencing sustainability transformations. The politicization of climate science, the spread of

[1] Justice as a phenomenon has featured in a number of the recent ERC and Horizon Projects (i.e. starting 2023 and later), however, most of these are still in their early stages and their outputs are thus premature to assess.

misinformation, and the perceived detachment of scientific institutions from public concerns have contributed to a growing distrust in scientific expertise (e.g. the H2020 PERITIA project). Research highlights the importance of co-production of knowledge, in which scientists work collaboratively with policymakers, practitioners, and local communities to develop sustainability solutions that are socially robust and contextually relevant (e.g. the H2020 ISEED project). When scientific research is perceived as embedded within the realities of affected populations, rather than imposed from external institutions, it fosters credibility and trust. Additionally, transdisciplinary approaches, which integrate knowledge from diverse academic disciplines and non-academic sources, have been found to enhance legitimacy by acknowledging the complexity of sustainability challenges and avoiding the oversimplifications that often alienate key stakeholders.

Participatory governance is widely recognized as a key strategy for building trust in sustainability transitions. However, research has demonstrated that participatory mechanisms are not inherently effective unless they provide a means of meaningful decision-making engagement to participants (e.g. the H2020 EUCOMMEET project). Many participatory processes suffer from tokenism, where stakeholders are invited to discussions but lack genuine influence over policy outcomes. The success of participatory governance depends on creating institutional mechanisms that allow communities to shape sustainability policies, rather than merely providing input into pre-determined frameworks (e.g. the HE INCITE-DEM project). The rise of citizens' assemblies, deliberative democracy initiatives, and decentralized governance models has shown promise in improving trust by fostering direct engagement in sustainability decision-making. However, challenges remain in ensuring that these participatory models are representative, accessible, and influential in policy formulation (e.g. the H2020 EUSOCIALCIT project).

One of the most pressing contemporary challenges to trust-building in sustainability governance is the proliferation of misinformation and disinformation regarding environmental policies and climate action (e.g. the HE RECLAIM and SOLARIS projects). The digital media landscape has accelerated the spread of false narratives about sustainability, often framing climate policies as economically harmful, politically motivated, or socially divisive (e.g. the HE SoMe4Dem and TWON projects). Research suggests that countering misinformation requires more than just fact-checking or correcting false claims; instead, it necessitates proactive communication strategies that frame sustainability transitions in ways that resonate with different social groups (e.g. the HE SMIDGE and ATHENA projects). Engaging trusted community leaders, leveraging storytelling, and embedding sustainability messages within culturally relevant narratives have been identified as effective approaches to fostering trust and countering scepticism (e.g. the HE Planet4B project). Moreover, the role of media literacy and science communication training in building public resilience to misinformation has gained increasing attention in sustainability-related research (e.g. the HE DIACOMET project).

Finally, state-of-the-art research underscores the importance of adaptive and reflexive governance in maintaining trust and legitimacy over time (e.g. the HE TRUEDEM project). Sustainability transformations are inherently complex and involve significant uncertainties, requiring governance structures that can respond to evolving challenges while maintaining public confidence. Studies indicate that rigid, top-down approaches to sustainability governance often struggle to maintain legitimacy, especially when policies encounter unexpected socio-economic or environmental challenges (e.g. the H2020 TRIGGER project). Instead, adaptive governance frameworks, which emphasize flexibility, continuous learning, and iterative policy adjustments based on stakeholder feedback, are seen as more effective in sustaining trust. The legitimacy of sustainability transformations is strengthened when governments and institutions acknowledge uncertainties, openly communicate trade-offs, and demonstrate a willingness to revise policies in response to public concerns.

Overall, research in sustainability science and related disciplines highlights that trust and legitimacy are not static attributes but must be continuously cultivated through inclusive governance, justice-oriented policy frameworks, science-society collaboration, and proactive communication strategies (e.g. the H2020 EnTrust project). Ensuring that sustainability transformations are seen as legitimate by diverse populations requires moving beyond conventional top-down policymaking and embracing participatory, transparent, and context-sensitive approaches that recognize the deeply political nature of sustainability transitions.

7.2. Knowledge gaps

7.2.1. Trust and distrust in policy, governance, institutions and science

Effective action requires trust in institutions, science, and governance mechanisms. Currently, institutional distrust remains a major barrier to sustainability transitions, particularly in communities that feel excluded from decision-making processes (e.g. the HE AUTHLIB project). While some projects address participatory governance, they often fail to tackle the root causes of distrust, such as historical inequalities (e.g. the HE EXIT project), lack of policy coherence, and failures in environmental justice. Research should move beyond procedural participation and explore substantive forms of co-governance, where communities have real decision-making power over sustainability policies. Moreover, empirical studies should examine how transparent governance, adaptive institutions, and restorative justice approaches can rebuild legitimacy in sustainability governance.

Research urgently needs to address the factors that drive public trust (or distrust) in transformation-related policies and institutions and how trust in political and

scientific institutions can be built or restored in the face of growing disinformation/misinformation and polarization. In this respect, longitudinal studies tracking public trust across different policy interventions can help address this question.

In addition, research needs to focus on how trust varies between centralized and decentralized sustainability governance models, for instance, whether people are more likely to trust transformative action when led by municipalities and communities rather than national governments.

Finally, research needs to address the long-term impact of sustainability transformation policies (including e.g. carbon taxes or job retraining) on trust in sustainability institutions and social cohesion.

Concerning the trust issues related to science, research needs to address how scientific uncertainty can be communicated without undermining legitimacy.

7.2.2. Participation and participatory governance models

Building trust requires robust mechanisms that enable citizens to actively shape and influence policy decisions and their implementation. While participatory governance is recognized as essential for legitimacy, its application faces challenges such as power imbalances, tokenistic inclusion, and low citizen engagement. While participatory models like citizens' assemblies and deliberative processes are gaining traction, their effectiveness in building trust and legitimacy remains underexplored. Thus, research is needed to evaluate how these and other participatory governance models can enhance transparency and inclusiveness in sustainability policymaking and to identify barriers to their successful implementation in different sociopolitical contexts.

In addition, studies should further examine how participatory governance can address tensions between local priorities and global sustainability goals, ensuring decisions are both context-sensitive and aligned with broader objectives.

Finally, it is essential to develop and test new participatory models, including digital platforms, to strengthen public involvement in decision-making processes. In this respect, innovative approaches, like integrating AI tools to streamline feedback and decision-making or combining local knowledge with scientific expertise, need to be explored.

7.2.3. Trust and legitimacy assessment

Although legitimacy is vital for policy acceptance, it remains challenging to measure comprehensively. Developing robust indicators and tools to measure trust and legitimacy in sustainability governance can help policymakers identify and address public concerns. Research should focus on a combination of

quantitative measures (e.g., trust indices, public satisfaction surveys) and qualitative approaches (e.g., assessments of inclusiveness and procedural fairness). Furthermore, research needs to assess how public perceptions of fairness, inclusiveness, and transparency in policy-making vary depending on cultural, political, and demographic contexts. For example, longitudinal studies tracking trust in institutions over time could reveal how governance decisions impact public sentiment. Investigating how different demographic groups perceive legitimacy – based on factors like gender, ethnicity, or economic status – could uncover disparities that undermine inclusive policy-making. These metrics would provide actionable data for policymakers aiming to strengthen legitimacy in sustainability transitions.

7.2.4. Misinformation/disinformation, media and communication

The growing prevalence of misinformation about sustainability transformation policies highlights the need for effective communication strategies, which are essential to counter misinformation/disinformation and build public trust. In this respect, research needs to address how misinformation/disinformation about sustainability and transformation issues circulate, and how it can be countered to mitigate significant polarization and political implications.

At the same time, the role of media and communication strategies in building trust and countering disinformation/misinformation around sustainability transformations is not fully understood (e.g. the H2020 MEDIAdelcom and MEDIATIZED EU projects). Research needs to examine how traditional media outlets, social media influencers, and community leaders frame sustainability transformation issues, shape public perceptions and trust and foster constructive dialogue.

Furthermore, research needs to investigate how different communication approaches – ranging from local storytelling to fact-checking initiatives – can strengthen public trust in scientific and policy institutions while mitigating polarization. However, research also needs to elucidate how the efficiency of these efforts relates to broader political grievances. Emphasis can be placed on identifying strategies to address public scepticism and polarization.

With respect to influencers, celebrities and digital activist, research needs to focus on the conditions under which digital platforms increase accessibility of information and sentiments nurturing transformations as opposed to creating new hierarchies and power asymmetries.

8. Democratization of the green transition

8.1. State of the art

The democratization of the green transition has emerged as a critical area of inquiry within sustainability science and related social sciences and humanities. Research increasingly highlights that top-down governance models, while efficient in policy implementation, often lack the legitimacy, inclusivity, and equity necessary to achieve transformative and enduring sustainability outcomes (e.g. the HE DUST project). Scholars emphasize that the green transition cannot be solely driven by technological innovation or market-based solutions; rather, it must be deeply embedded in participatory, justice-oriented, and deliberative governance structures that actively involve diverse societal actors in shaping sustainability pathways. Contemporary research underscores that democratizing sustainability governance is not just a normative ideal but a practical necessity for fostering trust, ensuring social acceptability, and mitigating resistance to climate and environmental policies (e.g. the H2020 InDivEU project.

A key area of advancement is the study of participatory governance mechanisms, which explore how citizens, civil society organizations, and local communities can meaningfully engage in decision-making processes (e.g. the HE Fairville project). Empirical research demonstrates that deliberative democratic models, such as citizens' assemblies, participatory budgeting, and co-design approaches, can enhance the legitimacy of sustainability transitions by incorporating plural knowledge systems and value orientations (e.g. the H2020 Real Deal project). However, studies also reveal that participation alone does not guarantee influence, as power asymmetries, elite capture, and procedural inefficiencies often hinder the effectiveness of democratic engagement (e.g. the H2020 PHOENIX project). In many cases, deeply embedded institutional routines and long-standing bureaucratic structures resist change, prioritizing stability over adaptability and making it difficult for new participatory mechanisms to translate into real shifts in governance. Additionally, sustainability policies are often shaped by dominant worldviews and expert-driven interpretations that exclude alternative knowledge systems, creating barriers to meaningful inclusion by reinforcing pre-existing discourses rather than accommodating diverse perspectives. This has led to increasing scholarly attention on the need for institutional reforms that ensure participatory governance mechanisms have binding influence over sustainability policies rather than serving as symbolic or consultative exercises.

Another frontier in democratization research relates to the political economy of the green transition, particularly how economic structures and financial mechanisms shape participation and access to sustainability benefits. Scholars critically examine how green growth strategies, if implemented without attention to distributional justice, risk exacerbating inequalities by disproportionately

benefiting wealthier groups while imposing costs on marginalized communities (e.g. the H2020 ACCTING project). Research highlights that an array of mechanisms including energy democracy, community-owned renewable energy projects, and cooperative models provide alternative governance arrangements that challenge centralized and corporate-dominated sustainability infrastructures (e.g. the H2020 SHARED GREEN DEAL project). These initiatives are studied as key leverage points for democratizing access to clean energy, land use, and environmental decision-making, as they redistribute control over sustainability resources away from monopolistic interests and toward local communities. However, challenges remain in scaling up these models while safeguarding their democratic integrity and avoiding co-optation by dominant economic and political actors.

The role of digitalization and e-democracy in green transition governance has also gained significant attention in recent research (e.g. the HE ST4TE project, the H2020 EUROSHIP project). Emerging studies explore how digital platforms, blockchain-based decision-making, and AI-enhanced deliberation can facilitate broader and more inclusive participation in sustainability governance (e.g. the HE ITHACA and ORBIS projects). These technologies offer potential for real-time citizen engagement, transparent policy monitoring, and decentralized decision-making, but scholars caution that they also introduce risks related to digital divide issues (e.g. the H2020 SO-CLOSE project, the H2020 ETAPAS project), data privacy concerns, and algorithmic biases that may reinforce existing inequalities rather than mitigate them (e.g. the HE INCA project). Critical research in this area examines the conditions under which digital tools enhance democratic governance rather than serving as technocratic instruments controlled by a narrow set of actors (e.g. the HE AI4Gov and KT4D projects).

Finally, research in sustainability science and social sciences increasingly emphasizes the political nature of sustainability transitions, arguing that democratization efforts must confront power asymmetries, corporate influence, and systemic resistance from entrenched interests (e.g. the HE REBALANCE and DemoTrans projects). The study of climate justice movements, labour unions, and grassroots sustainability activism highlights how democratic participation in sustainability transitions extends beyond formal governance mechanisms to include contestation, resistance, and alternative governance models that challenge dominant neoliberal paradigms. Scholars argue that democratization cannot be reduced to inclusion in existing structures but must involve transformative shifts in governance systems, economic frameworks, and institutional accountability to create genuinely participatory and justice-cantered green transitions.

Taken together, state-of-the-art research suggests that ensuring the interplay with democratization is not merely an accessory to the green transition but a fundamental determinant of its success and legitimacy (e.g. the HE PROTEMO project). The shift toward more democratic sustainability governance requires deep structural changes that go beyond participation to ensure equitable

decision-making power, control over resources, and mechanisms that hold powerful actors accountable in shaping sustainability futures (e.g. the HE CO-SUSTAIN project).

8.2. Knowledge gaps

8.2.1. Policy co-design for democratic sustainability governance

Although co-designing policies with diverse stakeholders is increasingly recognized as a valuable approach, there is still a lack of practical guidance on how to implement it effectively. Research needs to focus on developing participatory frameworks that can accommodate varying levels of expertise, cultural norms, and power dynamics. It is crucial to explore how different types of participatory policy co-design (e.g. deliberative polling, participatory budgeting) can enhance public engagement and policy acceptance. Moreover, there is a pressing need to study how to institutionalize participatory democracy in sustainability governance beyond isolated pilot projects and mitigate the institutional and bureaucratic barriers that hinder its implementation.

8.2.2. Economic justice and the green transition

Sustainability transitions are frequently framed as economic opportunities, but insufficient attention has been given to the intersection between green policies and economic justice. Research should examine how green transitions affect wealth concentration, access to sustainable resources, and economically vulnerable and marginalized communities. Additionally, it is necessary to investigate how to balance democratic governance with economic efficiency in sustainability policymaking. Moreover, impacts of strategies such as redistributive mechanisms, progressive taxation, and social protection measures should be explored to ensure that the costs and benefits of green transitions are distributed equitably.

8.2.3. Inclusive participation and representation

Despite ongoing efforts to enhance democratic engagement in the green transition, participatory processes frequently remain superficial or under the control of elite voices. Thus, it is essential to explore how marginalized and vulnerable groups, including local communities, youth, informal workers, and migrants, can be genuinely included in decision-making rather than being relegated to symbolic roles. Additionally, there is a need to investigate the various barriers to participation in sustainability governance, such as time

poverty, limited access to information, language constraints, and socio-economic disparities.

8.2.4. E-participation technologies and digital democracy

The use of digital tools, including online deliberation forums and e-petition systems, has the potential to expand democratic engagement in the green transition. However, several challenges remain unresolved, e.g. the digital divide continues to exclude low-income individuals, elderly populations, and rural communities from participating in e-governance (e.g. the SO-CLOSE project).

Additionally, concerns related to misinformation, algorithmic biases, and surveillance risks undermine public trust in digital democracy. In this respect, only limited research exists on how technologies such as blockchain, artificial intelligence, and decentralized platforms can enhance transparency and inclusivity while mitigating the risks associated with technocratic control (e.g. the H2020 TOKEN and IMPULSE projects).

8.2.5. The role of civil society

Civil society organizations (e.g. labour unions) and community organizations play an essential role in shaping sustainability policies, yet their influence on institutional policymaking remains underexplored. Similarly, alternative governance models (e.g. citizen-owned renewable energy cooperatives, community land trusts) need to be analysed to assess their potential to challenge existing power structures and promote transformative decision-making. With respect to social and grassroot movements, research should focus on understanding how such movements can drive long-term institutional change beyond protests.

8.2.6. Sustaining and scaling community-led initiatives

Community-led sustainability initiatives (e.g. urban greening projects and renewable energy cooperatives) offer valuable opportunities for grassroots innovation. However, they are frequently challenged by funding constraints, lack of political support and scalability issues. Further research needs to examine how to create enabling environments that support these initiatives. Additionally, it is important to understand the power dynamics within these initiatives to ensure that marginalized voices are not overshadowed by dominant actors. Finally, studies should assess how successful models can be replicated across different socio-political and cultural contexts while maintaining their local relevance and inclusivity.

8.2.7. Technology justice and access to green innovation

Technological advancements play a crucial role in sustainability transitions, yet access to these innovations remains unequal. Research should investigate how to ensure equitable access to green technologies across different income levels, regions, and social groups (e.g. the H2020 URBANAGE project). Moreover, it is necessary to explore the potential risks of green innovation exacerbating existing inequalities (see e.g. related research within the H2020 Technequality) and unsustainable consumption patterns. Research should examine how policy measures can be developed to prevent the monopolization of green technologies by powerful corporations, ensuring that technological advancements contribute to a more just and inclusive transition.

8.2.8. Structural power and political barriers

Although policy proposals highlight the need for structural political changes that shift governance power toward sustainability-aligned institutions, entrenched power structures have been identified as political barriers to sustainability transformations. In this respect, there is a critical lack of understanding of how to dismantle entrenched power structures related to the green transition and facilitate broad-based democratic participation in decision-making. Specifically, research needs to address how to balance out the dominance of actors deeply embedded within political and economic systems who benefit from unsustainable and unjust processes (e.g. fossil fuel industries, corporate interests, and political elites), and how to counter the influence of these actors to establish governance structures that prioritize sustainability and social equity.

Annex II Related Horizon 2020 and Horizon Europe projects

FP	ID	Acronym	Title	Master Call	Funding scheme
Horizon Europe	101094190	ActEU	Towards a new era of representative democracy - Activating European citizens' trust in times of crises and polarization	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101094905	AI4Gov	Trusted AI for Transparent Public Governance fostering Democratic Values	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101132686	ATHENA	An exposition on THe forEign informatioN mAnipulation and interference	HORIZON-CL2-2023-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101060899	AUTHLIB	Neo-authoritarianisms in Europe and the liberal democratic response	HORIZON-CL2-2021-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101132467	CO-SUSTAIN	pathways for CO-creation between local authorities and collective actions for a SUSTAINable transition	HORIZON-CL2-2023-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101094217	CRITICAL CHANGELAB	Democracy meets arts: critical change labs for building democratic cultures through creative and narrative practices	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
H2020	822590	DEMOS	Democratic Efficacy and the Varieties of Populism in Europe	H2020-SC6-GOVERNANCE-2018	RIA
Horizon Europe	101059288	DemoTrans	The Interchange Between Democratic Institutions and the Globalisation of the Economy	HORIZON-CL2-2021-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101094816	DIACOMET	Fostering capacity building for civic resilience and participation: Dialogic communication ethics and accountability	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
H2020	822314	DISCE	Developing Inclusive & Sustainable Creative Economies	H2020-SC6-TRANSFORMATIONS-2018	RIA
Horizon Europe	101094869	DUST	Democratising jUst Sustainability Transitions	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
H2020	870572	EnTrust	Enlightened trust: An examination of trust and distrust in governance – conditions, effects and remedies	H2020-SC6-GOVERNANCE-2019	RIA
H2020	101004594	ETAPAS	Ethical Technology Adoption in Public Administration Services	H2020-SC6-TRANSFORMATIONS-2020	RIA

FP	ID	Acronym	Title	Master Call	Funding scheme
H2020	959234	EUCOMMEET	Developing Participatory Spaces using a Multi-stage, Multi-level, Multi-mode, Multi-lingual, Dynamic Deliberative approach (M4D2)	H2020-SC6-GOVERNANCE-2020	RIA
H2020	870698	EUROSHIP	Closing gaps in social citizenship. New tools to foster social resilience in Europe	H2020-SC6-GOVERNANCE-2019	RIA
H2020	870978	EUSOCIALCIT	The Future of European Social Citizenship	H2020-SC6-GOVERNANCE-2019	RIA
Horizon Europe	101061122	EXIT	EXPLORING SUSTAINABLE STRATEGIES TO COUNTERACT TERRITORIAL INEQUALITIES FROM AN INTERSECTIONAL APPROACH	HORIZON-CL2-2021-TRANSFORMATIONS-01	HORIZON-RIA
Horizon Europe	101094991	Fairville	Facing Inequalities and democratic challenges through Co-production in Cities	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
H2020	101004459	IMPULSE	Identity Management in PUbLic SErvices	H2020-SC6-TRANSFORMATIONS-2020	RIA
Horizon Europe	101061653	INCA	INcrease Corporate political responsibility and Accountability (INCA)	HORIZON-CL2-2021-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101094258	INCITE-DEM	INCITE-DEM – Inclusive Citizenship in a world in Transformation: Co-Designing for Democracy	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
H2020	822304	InDivEU	Integrating Diversity in the European Union	H2020-SC6-GOVERNANCE-2018	RIA
H2020	960366	ISEED	Inclusive Science and European Democracies	H2020-SC6-GOVERNANCE-2020	RIA
Horizon Europe	101094364	ITHACA	artificial Intelligence To enHAnce Civic pArticipation	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101094302	KT4D	Knowledge Technologies for Democracy	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101094984	MeDeMAP	Mapping Media for Future Democracies	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
H2020	101004811	MEDIADELCOM	Critical Exploration of Media Related Risks and Opportunities for Deliberative Communication: Development Scenarios of the European Media Landscape	H2020-SC6-TRANSFORMATIONS-2020	RIA

FP	ID	Acronym	Title	Master Call	Funding scheme
H2020	101004534	MEDIATIZED EU	Mediatized Discourses on Europeanization and Their Representations in Public Perceptions	H2020-SC6-TRANSFORMATIONS-2020	RIA
Horizon Europe	101094765	ORBIS	Augmenting participation, co-creation, trust and transparency in Deliberative Democracy at all scales	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
H2020	870883	PERITIA	Policy, Expertise, and Trust in Action	H2020-SC6-GOVERNANCE-2019	RIA
H2020	822682	POPREBEL	Populist rebellion against modernity in 21st-century Eastern Europe: neo-traditionalism and neo-feudalism	H2020-SC6-GOVERNANCE-2018	RIA
Horizon Europe	101132433	PROTEMO	Emotional dynamics of protective policies in an age of insecurity	HORIZON-CL2-2023-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101061342	REBALANCE	Rebalancing disruptivE Business of multinAtional corporation and gLobal value chAins within democratic and iNClusive citizenship processes	HORIZON-CL2-2021-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101061330	RECLAIM	Reclaiming Liberal Democracy in Europe	HORIZON-CL2-2021-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101093987	ReIncluGen	Rethinking Inclusion and Gender empowerment: A participatory action research	HORIZON-CL2-2022-TRANSFORMATIONS-01	HORIZON-RIA
Horizon Europe	101094742	ReMeD	RESILIENT MEDIA FOR DEMOCRACY IN THE DIGITAL AGE	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101095290	SMIDGE	Social Media narratives: addressing extremism in middle age	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
H2020	870939	SO-CLOSE	Enhancing Social Cohesion through Sharing the Cultural Heritage of Forced Migrations	H2020-SC6-TRANSFORMATIONS-2019	RIA
Horizon Europe	101094665	SOLARIS	Strengthening demOcratic engagement through vaLue-bAsed geneRative adversarIal networkS	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101094752	SoMe4Dem	Social media for democracy – understanding the causal mechanisms of digital citizenship	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101094551	SPES	Sustainability Performances, Evidence and Scenarios	HORIZON-CL2-2022-TRANSFORMATIONS-01	HORIZON-RIA
Horizon Europe	101132559	ST4TE	Strategies for just and equitable transitions in Europe	HORIZON-CL2-2023-TRANSFORMATIONS-01	HORIZON-RIA

FP	ID	Acronym	Title	Master Call	Funding scheme
H2020	822330	TECHNEQUALITY	Technological inequality – understanding the relation between recent technological innovations and social inequalities	H2020-SC6-TRANSFORMATIONS-2018	RIA
H2020	870722	TiGRE	Trust in Governance and Regulation in Europe	H2020-SC6-GOVERNANCE-2019	RIA
Horizon Europe	101094211	ToBe	Towards a sustainable wellbeing economy: integrated policies and transformative indicators	HORIZON-CL2-2022-TRANSFORMATIONS-01	HORIZON-RIA
H2020	870603	TOKEN	Transformative Impact Of BlocKchain tEchnologies iN Public Services	H2020-SC6-TRANSFORMATIONS-2019	RIA
H2020	822735	TRIGGER	TRends In Global Governance and Europe's Role	H2020-SC6-GOVERNANCE-2018	RIA
Horizon Europe	101095237	TRUEDEM	Trust in European Democracies	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
Horizon Europe	101095095	TWON	TWin of Online Social Networks	HORIZON-CL2-2022-DEMOCRACY-01	HORIZON-RIA
H2020	870898	UPLIFT	Urban PoLicy Innovation to address inequality with and for Future generaTions	H2020-SC6-TRANSFORMATIONS-2019	RIA
H2020	101004590	URBANAGE	Enhanced URBAN planning for AGE-friendly cities through disruptive technologies	H2020-SC6-TRANSFORMATIONS-2020	RIA
H2020	870338	URBANITE	Supporting the decision-making in URBAN transformation with the use of dIsruptive TEchnologies	H2020-SC6-TRANSFORMATIONS-2019	RIA
Horizon Europe	101095219	WISE Horizons	Wellbeing, inclusion, sustainability and the economy	HORIZON-CL2-2022-TRANSFORMATIONS-01	HORIZON-RIA
H2020	870619	WorkYP	Working, Yet Poor	H2020-SC6-GOVERNANCE-2019	RIA

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Conclusions and preliminary recommendations

The intersection of society- and governance-related factors of transformation towards more just and sustainable future– under the pressures of climate and environmental change, technological acceleration, demographic shifts, and geopolitical shocks – represents one of the most complex and consequential research frontiers for Europe's transformation agenda. This intersection is characterized by a number of knowledge gaps, whose addressing is essential not only to improve policy coherence and inclusivity but also to strengthen the transformative capacity of European governance.

At the core of these challenges is the difficulty of defining and applying the idea of fairness. On one level, there is a need for a consolidated framework for embedding fairness into transformative policies, the governance system and its instruments. On another, fairness needs to be understood not only in distributive terms but also in relation to recognition and participation, which are shaped by underlying cultural narratives, political ideologies, and structural inequalities. Research needs to address how divergent values, worldviews, and lived experiences condition the way fairness is perceived and enacted across European societies. This demands an integrated agenda linking normative theory, behavioural insights, and institutional practice in a contextually and historically sensitive way.

In parallel, there is a lack of empirical understanding about how existing policy instruments operate and are implemented by different actors across different social, economic, and territorial contexts, as well as their efficiency and potential multi-dimensional, cross-cutting and spillover effects. Current transformation-related policies often fail to capture the diversity of lived experiences, particularly with respect to labour market transitions, income precarity, and regional disparities. Moreover, insufficient attention is paid to cultural, emotional, and intergenerational dimensions of policy legitimacy, especially among youth, rural communities, and marginalized populations. Thus, the evidence base needs to be expanded to interrogate how social norms, identity, structural lock-ins, and symbolic politics mediate the uptake and impact of transformation policies. There is an urgent need for studies that look at both the visible structures of inequality and the less obvious cultural patterns, narratives, and assumptions that shape public support for change. In this respect, tools need to be developed to ensure that technological and policy innovations are not decoupled from social realities, undermining their potential to build public trust or reflect everyday experiences of transition.

The study points to a consistent shortfall in how trust, legitimacy, and public participation are understood and put into practice. Too often, current governance approaches rely on formal consultation processes that give the appearance of inclusion but offer limited real influence. When participation is symbolic or surface-level, it can end up reinforcing existing power imbalances rather than

challenging them. This not only limits the impact of such efforts but also risks increasing public distrust and weakening support for climate and social policies.

Addressing this requires a fundamental rethinking of governance functions and institutional configurations. Research must focus on designing participatory mechanisms that go beyond symbolic inclusion, and instead establish robust, deliberative infrastructures capable of negotiating difference and managing conflict. This includes building adaptive, learning-oriented governance systems that acknowledge uncertainty and enable reflexivity. It also involves addressing power asymmetries – socio-economic, geographical, generational and epistemic – that structure who is heard, who benefits, and who bears the cost of transformation. Trust in transition governance cannot be restored without tackling these deeper questions of representation and accountability, nor without confronting the communicative failures and legitimacy deficits that undercut democratic engagement. This is especially vital in settings where institutional trust is fragile and where standard policy tools are perceived as opaque, unresponsive, or unjust.

A further gap lies in the limited institutional and epistemic capacity to govern complex, multi-scalar transitions. Both public institutions and civil society actors often lack the tools, resources, or mandates to co-produce knowledge and design context-sensitive solutions. Research needs to elucidate how to nurture enabling conditions and build capacities for institutional experimentation, learning, and innovation.

Finally, the report emphasises the need to reorient transformation research around long-term societal learning. Transformation outcomes cannot be meaningfully understood without longitudinal insights into how values, behaviours, and governance cultures evolve over time. There is a need for research infrastructures that trace shifts in legitimacy, affect, and collective imaginaries, and that can surface how experiences of uncertainty, disillusionment, or hope influence transition dynamics. In this context, youth perspectives, emotional engagement, digital cultures, and post-growth imaginaries emerge as crucial elements in designing research that resonates with diverse publics and informs more inclusive, future-oriented policymaking.

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