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SYSTEMATIC REVIEW AND MAPPING OF GOVERNMENTS' SUSTAINABLE INITIATIVES AND ENTREPRENEURIAL EXPECTATIONS

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Abstract. This systematic literature review aimed to map existing governmental practices aimed at achieving Sustainable Development Goals (SDGs) and comparing them with entrepreneurial expectations. The primary objective was to identify gaps in existing policies concerning sustainability initiatives. The review employed a systematic search strategy in one of the primary scientific publication databases over the last three years, focusing on Organisation for Economic Co-operation and Development (OECD) countries. Inclusion criteria involved studies addressing "sustainability" and "state interventions", and synonyms. The assessment methodology incorporated PICO criteria and content analysis, with rigorous double-check controls. A total of 367 studies on sustainability interventions were included, with in-depth analysis of 185 articles. The review highlighted that those governmental measures primarily concentrated on pivotal factors crucial to entrepreneurs, such as robust policies, investments, and effective communication strategies. The synthesis of findings from this systematic review emphasizes the importance of bridging gaps between governmental sustainability initiatives and entrepreneurial expectations. It illuminates key areas where policy alignment could be optimized, offering insights into additional factors pivotal for a more comprehensive and effective approach towards achieving SDGs. Using the PICO methodology to evaluate the effectiveness of applied interventions, authors concluded that while this methodology can improve research question formulation and evidence identification in social science, our review found that studies often lack a clear statement of the problem, rarely report intervention failures, and seldom present alternative approaches.

Keywords: sustainable development goals, government interventions, PICO, sustainability barriers.

JEL Classification: Q56, Q58.

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1. Introduction

The United Nations (2015) General Assembly adopted a new global framework for sustainable development on September 25, 2015. This framework gradually integrated into the development strategies of numerous countries' governments, stakeholders of global corporations, and influential public organizations, has become a standard for sustainability efforts. The European Union (EU) has emerged as a leader in global sustainability by setting ambitious climate and energy goals for 2030, known as the European Green Deal. By 2050, the EU aims to achieve net-zero greenhouse gas emissions, disconnect economic growth from resource consumption, and ensure that no individual or region is left behind. According to the European Green Deal, funding will be directed towards sustainable projects and actions, defined, and classified under the EU's Taxonomy Regulation (European Union, 2020). Additionally, socially responsible companies will be held accountable for Environmental, Social, and Governance (ESG) sustainability, encompassing environmental, social, and governance components to achieve these objectives. Consequently, both public and private funding will significantly rely on the sustainability of economic activities. Therefore, the financial tools for ensuring sustainability are quite clear: financial aid, subsidies, credits, as well as penalties for actions resulting in negative environmental externalities, such as carbon taxes. Nevertheless, our previous investigations (Hudenko et al., 2022), conducted through a focus group involving both state and private entities, policy makers, and state bodies within the Latvian railway sector, have revealed a low level of awareness of ESG principles. The study has raised important questions about railway stakeholders' motivations in developing sustainable development strategies: policy makers do not account for the readiness of the final consumer market, but undertakings rely on greenwashing advantages without making efforts to enhance efficiency, flexibility, connectivity, and cost-effectiveness of their products. Chiappinelli et al. (2021) also highlight those investments in climate-

friendly technologies face impediments arising from technological, economic, and regulatory barriers.

This motivated to investigate whether the awareness of ESG principles extends beyond the railway sector. This study aimed to understand the broader context by examining what barriers might hinder stakeholders from actively participating in Sustainable Development Goals (SDGs) and whether there is a nexus between state policies and these barriers. A quick search of the "Web of Science" database, employing the keywords "barriers" AND "green deal", initially yielded 361 articles, with 147 articles published in the years 2021, 2022, and 2023. A n initial review of 31 scientific articles, specifically focusing on "Management", revealed that both internal concerns, such as limited access to information, funding, and technology (Hazudin et al., 2023) and external concerns including regulatory complexities, resource constraints, lack of awareness, and the challenge of aligning economic, social, and environmental objectives (Egieya et al., 2023; Rosário et al., 2022; Terán-Yépez et al., 2020) play significant roles in shaping attitudes toward sustainability. State interventions to promote sustainable entrepreneurship typically include public funding, support programs, and regulatory frameworks (Panghal et al., 2021; Vig, 2022), where public funding is identified as a key driver that can positively influence entrepreneurs' attitudes toward sustainability (Panghal et al., 2021). Institutional structures and support are also crucial for enabling sustainable innovation, especially in small and medium-sized enterprises (SMEs) (Vig, 2022; Prakash et al., 2023). While the evidence recognizes the importance of both entrepreneurial concerns and state interventions, there is a lack of comprehensive frameworks that systematically connect specific categories of entrepreneurial concerns with corresponding state interventions and their outcomes (Di Vaio et al., 2022). Most studies focus on either the drivers of sustainable entrepreneurship or the types of interventions, but few analyse the direct relationships between entrepreneurs' expressed concerns and the targeted effectiveness of state policies (Di Vaio et al., 2022). Additionally, empirical evidence on the actual impacts of these interventions, especially in diverse cultural and economic contexts, remains limited (Hazudin et al., 2023).

A need for research that categorizes and directly links entrepreneurs' concerns with specific state interventions and evaluates the outcomes of these policies was identified (Di Vaio et al., 2022). There are calls for frameworks that integrate stakeholder engagement, institutional theory, and context-specific policy design to better address the multifaceted challenges of sustainable entrepreneurship (Di Vaio et al., 2022; Rosário et al., 2022).

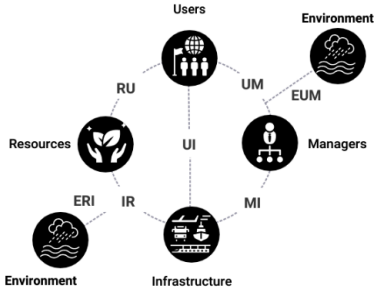
Therefore, the existence of the gap in understanding both the concerns of entrepreneurs and the state policies necessary to effectively address these concerns while fostering the development of new economic was hypothesised.

The objective of this paper is to bridge this gap by investigating and classifying the concerns of entrepreneurs, assessing the effectiveness of state policies in addressing these issues, and mapping the most effective incentives for each category of concern. The following research questions were stated:

- To identify and categorize the main concerns that entrepreneurs express in the context of adopting sustainable practices.
- To examine and categorize the primary interventions implemented by the state to address the concerns of entrepreneurs and promote sustainability.
- To establish connections between the identified categories of concerns among entrepreneurs and the corresponding categories of state interventions.
- To explore and analyse the outcomes or impacts of the state interventions on addressing the concerns of entrepreneurs.

Through a systematic examination of these research questions, this paper aims to contribute valuable insights into the dynamics between entrepreneurial concerns, state interventions, and the outcomes of such interventions within the context of sustainability initiatives.

Two theoretical frameworks were employed in the study: (1) the analysis of interventions was guided by a predefined set of categories derived from Anderies et al.'s (2004) framework of social-ecological systems, providing an institutional perspective. Widely adopted, particularly by the European Commission for evaluating the impact



Abbreviation	Entities	Examples
R	Resource	Water source; Fishery
U	Resource Users	Farmers using irrigation
M	Infrastructure managers	Government bureau
I	Infrastructure	Engineering systems
E	External Environment	Weather, Economy

Abbreviation	Link	Examples
RU	Between resource and resource users	Availability of water at time of need/availability of fish
UM	Between users and infrastructure managers	Voting for providers
MI	Between infrastructure managers and infrastructure	Building initial structure
IR	Between infrastructure and resource	Impact of infrastructure on the resource level
UI	Between users and infrastructure	Coproduction of infrastructure itself, maintenance of works, monitoring and sanctioning
ERI	Between infrastructure and resource dynamics	Impact of infrastructure on the feedback structure of the resource–harvest dynamics
EUM	Environment on social actors	Major changes in political system, migration, commodity prices, and regulation

Figure 1. Anderies et al. (2004) framework of social-ecological systems

of environmental regulations, this framework encompasses three fundamental categories: involved entities, links among entities, and types of interventions. See Figure 1; (2) the research of entrepreneur concerns draws on the theory of complex adaptive systems, as outlined by Meadows (2008). This theory emphasizes several key features of these systems: the inability to be completely controlled, emergent behaviour with feedback delays, a tendency toward self-organization and operation in patterns, and dependency on the collaboration of all components, with an aversion to changes in any one part.

In this study the widely accepted PICO (Population, Intervention, Comparison, Outcome) methodology for literature review was used to systematically identify and analyse the problem, possible interventions, and desired outcomes. PICO originated in clinical research to structure research questions and guide systematic literature searches. In recent years, its use and adaptation have expanded into the social sciences, where researchers face complex, multifaceted questions and require clear frameworks for question formulation and evidence synthesis. However, challenges and limitations specific to social research that impacted the application of this methodology were faced. These challenges are thoroughly addressed and explained in the methodology section of this study.

This study introduces a novel approach by systematically bridging specific entrepreneurial concerns with targeted public policy incentives, offering an evidence-based understanding of which types of state interventions are most effective in addressing distinct challenges. Given the high financial and administrative costs associated with sustainability-oriented public policies, this mapping contributes to a clearer understanding of the causal relationships between interventions and outcomes. It enables policymakers to more precisely identify the "treatments" most likely to yield successful results, ensuring better alignment with entrepreneurial expectations and SDGs.

Clarification of the meanings of key terms or concepts provided in the Appendix (Table A1).

The remaining paper is structured as follows: the methodology section and discussions regarding the limitations of the PICO methodology are thoroughly covered in the next section; the next section presents the outcomes of the literature review focusing on the identification of problems or barriers (P) and the interventions (I). It further explores the linkages between these elements; subsequently, the paper includes a discussion chapter that delves into the comparison (C) and outcomes (O) derived from the study's findings.

The systematic review has been registered in the Open Science Framework (OSF) and available online: https://osf.io/ptf2b, it incorporates links to Excel sheets containing raw data, enhancing transparency, and facilitating further exploration of the presented information.

2. Materials and methods

Aimed to systematically identify and analyse the nexus – null hypothesis was outlined in the reviewed research – among the concerns of entrepreneurs (problem), the interventions implemented by the state (intervention), and the effectiveness of these interventions (outcome). To achieve this, the PICO methodology was employed, originally established in evidence-based medicine and widely adopted for structuring research questions (Schiavenato & Chu, 2021). Nishikawa-Pacher (2022) findings that the PICO framework can be adapted for use across diverse disciplines and study designs by modifying its original components, as outlined in Table 1 was a methodological foundation of this study.

Table 1. Abstraction of PICO for social science's need

Original, according to Richardson et al. (1995)	Abstraction	Description
P: Referring to the "patient" or "population of interest" or describing a "problem"	research object	poses the research object or the unit that is being observed by the research
I: Signifying an "intervention"	a theory/ method	denotes the application of a method or a theory or the sequence of conceptual or practical steps with which knowledge generation about the research object can be achieved
C: Representing a "control" or "comparison"	a (null) hypothesis	alternative theories or methods, in the absence of which it is the null hypothesis
O: Indicating an "outcome" or "observation"	the goal of knowledge generation	often the goal of attaining a plausible explanation for an underlying research puzzle

Despite the empirical evidence supporting PICO efficacy in question formulation and search efficiency, Schiavenato and Chu (2021) highlight a fundamental limitation of PICO, emphasizing its focus on "which" questions, primarily suitable for selecting medical treatments or alternatives. However, Milner and Cosme (2017) recognize the prevalent use of PICO as a technique in guiding the construction of research objectives in academic writing. This structured approach ensures that crucial components are not overlooked when formulating research aims. Furthermore, several open-access scientific journal publishers, such as MDPI in its "Information for Authors" as 02.01.2023, adopt a similar structure within their publication guidelines. They strongly advocate for authors to adhere to a structure reminiscent of PICO, particularly in abstracts, where the fundamental elements of PICO can be effectively emphasized:

- Background: This section contextualizes the addressed question within a broader scope and accentuates the study's purpose.
- Methods: Briefly outlines the primary methodologies or treatments employed during the study.
- Results: Provides a concise summary of the article's principal findings.

- Conclusions: Highlights the main conclusions or interpretations drawn from the study's outcomes.

The use of the PICO methodology in abstract writing can significantly enhance the clarity and comparability of results across different studies. This structured approach facilitates a more logical understanding of existing research by clearly outlining the fundamental elements of a study – such as the problem, intervention, comparison (hypothesis tested), and outcome. This, in turn, helps in effectively communicating the study's purpose, methodologies, principal findings, and conclusions. By incorporating the PICO methodology in social sciences, researchers can improve the interpretability of results and advance evidence-based practice, promoting greater transparency and reproducibility in research findings.

The EBSCO model was provided a structured framework for conducting the PICO process see Figure 2.

Figure 2 presents a summary of the methodology used in a systematic review. The process is broken down into seven distinct steps:

Step 1: The research begun by defining a PICO focused question: "What are the outcomes of state interventions on addressing the concerns of entrepreneurs?"

Step 2: Relevant search terms were selected to guide the literature search. Synonyms for "sustainability" category, such as "eco-friendly", "sustainable development", "environmental sustainability", and "ecological", were identified, along with variations for "state" and "infrastructure". To refine our search, "AND" was to combine terms for each category and "OR" to include synonyms.

Step 3: A targeted search strategy was designed with the following parameters: Database: SCOPUS; Keywords: As above; Time frame: 2018–2022; Disciplinary focus: Social science; Geographic scope: OECD countries. This initial search retrieved 367 articles.

Step 4: The search was conducted in SCOPUS database using the defined parameters by one of the researcher.

Step 5: A two-stage exclusion process was implemented. 125 articles were excluded for being irrelevant or overly technical. The initial exclusion was conducted by one of the researchers. The remaining 243 publications were assessed using the formulated PICO criteria, detailed in Table 1, primarily focusing on abstract content. This PICO-based evaluation was carried out collaboratively by two researchers. Additionally, 56 articles were excluded within abstracts' assessment phase due to their factual irrelevance to the research question. Throughout this phase, the researchers consulted regularly to determine whether further exclusions were necessary.

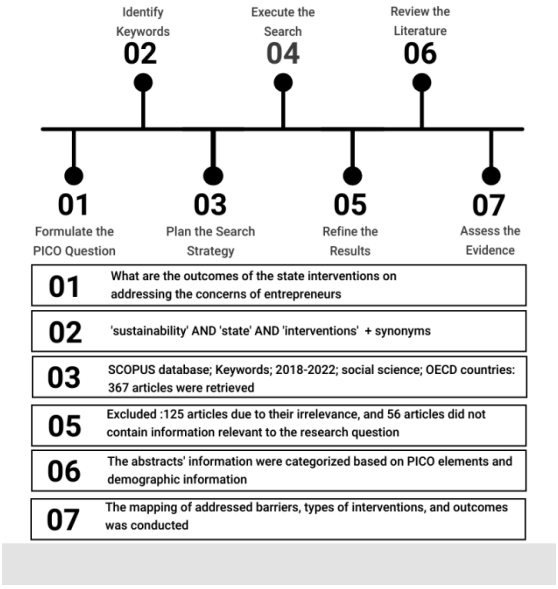


Figure 2. The framework of the PICO process

Step 6: The remaining abstracts were reviewed and categorized based on PICO elements (i.e., Population, Intervention, Comparison, Outcome). The PICO methodology was focused on the "Comparison" (C) category, to systematically identify the nexus – defined by our null hypothesis – in the reviewed research. This approach examined the relationship between the concerns of entrepreneurs (P – Problem), the interventions implemented by the state (I – Intervention), and the effectiveness of these interventions (O – Outcome). Demographic information was collected allowing comparison among sectors and consistent coding of study content.

Step 7: A mapping was conducted to link barriers addressed with types of interventions and those outcomes.

After this final step a synthesis of the evidence to highlight which state interventions are most effective in addressing different categories of entrepreneurial concerns was provided.

Figure 3 illustrates the demographic characteristics of the literature reviewed.

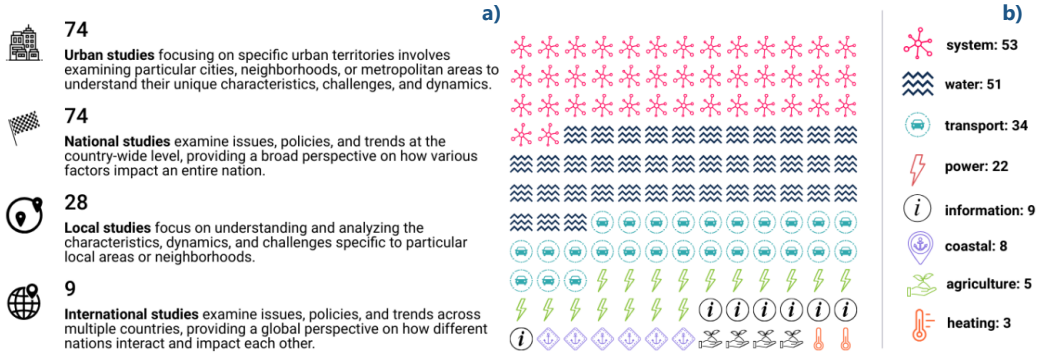


Figure 3. Demographic characteristics of reviewed literature: (a) intervention level; (b) infrastructure type

Figure 3a presents the distribution of intervention levels identified in the reviewed studies. Urban and national interventions were the most frequently described, with 74 studies each (80% of the total). Local interventions were examined in 28 studies (15%), while international interventions were explored in 9 studies (5%). Figure 3b illustrates the categorization of infrastructure systems, encompassing water, transportation, energy, information, coastal, agriculture, and heating, along with systematic approaches predominantly observed in urban studies. The distribution of infrastructure studies across categories varies as follows: interventions in the system approach and water infrastructure each account for approximately one-third of the studies, while transport and power are the focus of another third of the studies combined. Information, coastal, agriculture, and heating infrastructure are reviewed less frequently.

Many of the findings were successfully developed through careful interpretation of the available data. Although the abstracts and full texts of the reviewed articles often lacked key details, our approach effectively extracted valuable insights by applying dispute resolution methods to ensure fair and efficient conflict between two blind coders.

When interpreting the results, please note that the current predominant focus on urban water infrastructure in the reviewed literature restricted the broader conceptualization. Despite this limitation, the literature still offered significant insights into the methodology and its applications.

3. Results

The social-ecological system, as a complex adaptive system that inherently resistant to complete control, serves as the focal point for this research approach. Within this section, the findings derived from a systematic literature review were explored investigating nexus among entrepreneurial concerns and state interventions, as well as the outcomes of such interventions within the context of sustainability initiatives.

Firstly, frequently mentioned terms in problem statements and interventions proposed in the examined literature were identified and categorized. This process enabled identifying clusters of concepts that represent distinct themes and patterns. Different researcher perspectives on these concepts were explored as well. Finally, the relationships between state interventions and barriers were analysed to achieve stated objective.

3.1. Barriers to sustainable practices

To gain a thorough understanding of the obstacles impeding sustainability efforts, this section investigates into key concepts associated with the barriers extracted from a content analysis of the problem statement in observed literature.

Figure 4 depicts the results of the systematic review, identifying and categorizing the main concerns or barriers that entrepreneurs express regarding the adoption of sustainable practices.

Figure 4 reveals that barriers or clear problem statements related to sustainability were identified in only 79% of the reviewed studies. Among reported, the most frequently cited internal barriers were general mistrust or scepticism (25 out of 146), and governance issues (21 out of 146).

After reviewing the identified concepts of barriers, we categorized them into three distinct groups aligning with principles derived from complex system theory: scepticism, lack of feasibility, nexus flaw.

Scepticism. Dependency on the collaboration of all components, evidenced in 17% of problem-stated studies as a widespread general scepticism or a misalignment between "bottom-up involvement of stakeholders meeting top-down goal achievements" (Rowbottom et al., 2022). Slätmo et al. (2021), Benoliel et al. (2021), Ulibarri and Tao (2019) and other studies report that comparing bottom-up and top-down approaches the latest is crucial for the success, but Lee (2021) suggests that both approaches are effective. Moeletsi (2021) found that "the rollout of purchasing subsidies and tax rebates, received a high level of satisfaction among the respondents" for combating general scepticism. Furthermore, Conway et al. (2021) have demonstrated that the degree of concern regarding environmental issues is intricately connected to everyday

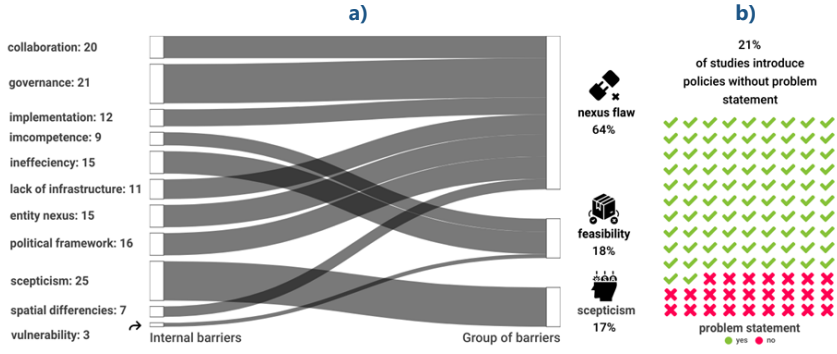


Figure 4. Barriers to achieve ESG extracted from a content analysis of the problem statement in observed literature: (a) categories of identified barriers to sustainable practices, mentions and %; (b) proportion of reviewed scientific papers in which the problem addressed by policy is clearly articulated, %

conceptualizations. This underscores the necessity of interpreting such concerns to consumers by aligning them with the emotional well-being of final consumers or residents, e.g. "green garden" vs "water resources" (Yu et al., 2020). Finewood et al. (2019) call it reframing the conversation in a way that opens up opportunities communities to voice their needs beyond the technocratic problem management.

Lack of feasibility. Feedback delays effect the feasibility of developments and noted by scepticism rooted in issues such as inefficiency, incompetency, and vulnerability. This was stated in 18% of the observed studies.

A prevalent theme in the literature notices the impact of scale inefficiencies on infrastructure projects, as evidenced, for instance, by Lo Storto (2022). Decision-making processes, as highlighted by Andreassen and Rosendahl (2022), are further complicated by the challenge of choosing suitable instruments to achieve project goals. However, it is essential to note the contrasting findings presented by Li and Jenn (2022) and Patel et al. (2021), indicating that well-informed decisions about infrastructure can mitigate both total system costs and emissions.

McWilliam and Wesener (2021) suggest that inefficiency may stem from incompetency. BenDor et al. (2018) emphasize the importance of program funding in ensuring the operational success of market-based programs. Moreover, Ma et al. (2021) and Liskounig (2019) argue for increased incentives to enhance the quality of services provided by operators. Addressing economic aspects, Bixler et al. (2020) highlight the significant role played by land and tax costs in equivalent annual costs. On the other hand, Eldosouky et al. (2021) showcase the benefits of contract-based resilience resource allocation, enabling system operators to economically benefit while improving resilience indices. Bohnenberger (2020) explores the economic feasibility of services through vouchers for ecologically beneficial or socially needed goods and services.

Dong et al. (2021) contribute to the discourse by underscoring the necessity of accounting for vulnerability in decision-making processes, especially concerning access to critical facilities in the face of disasters or regional disparities. The inclusion of vulnerability assessments is crucial for ensuring the long-term resilience of infrastructure projects.

Nexus' flaw. Operation in patterns lead another source of scepticism that is the belief that one part of the system works harder than others. This implies a doubt on the perceived work ethic and positions it as a systemic flaw, encompassing unfaithful governance and political frameworks, a lack of collaboration, and misalignments be-tween costs and benefits. Wang (2022) indicated the inadequacy of public participation and offered broad implications for environmental governance and expert-public relationships and adopting the co-benefits approach. Shen et al. (2021) concluded diversity of different level political framework and emphasize difficulties of integrating multiple purposes into single infrastructure project among various government agencies, private companies, and local communities and suggest stringent and transparent evaluation systems. Kumar et al. (2021) exploring electric mobility initiative discussed proper investment aim for developing of charging infrastructure, and conclude that under a limited budget constraint, the government can provide direct subsidy to consumers in order to facilitate demand and let EV manufacturer invests in charging infrastructure rather than developing of infrastructure with direct investments. Adshead et al. (2021) suggests that accounting for interdependencies and taking a long-term perspective can save costs over the life of infrastructure investments. Also, Li et al. (2020) explored involved multiple actors and various plans and emphasized that it is critical that actor coordination and plan integration are consistent with infrastructure dependencies. Bazzana et al. (2020) formalised the decision processes and the interactions between rural villages, districts and national governments in hierarchical and peer-to-peer networks could be mitigated by prevention-oriented governmental policies.

Merzlov (2022) emphasize, that collaboration public-private partnerships (PPP) has evolutionary nature and need a time to create more effective national PPP strategies. Searle and Legacy (2020) claims that public interest are open to interpretation and can be easily captured by the interests of capital and of ruling politicians. Heinemann (2018) concluded that distributed research infrastructures must satisfy present needs of a sustainable community network where knowledge, information and expertise is shared freely among partners. Chaffin et al. (2019) yet says that informal environmental governance networks is the best way of communication, but they differ substantially from the generally more hierarchical networks of organizations.

Spahr et al. (2021) shown that perceived value of ESG benefits are not valued uniformly across demographic groups and vary regionally and advocated that practitioners engage a representative subset of the population within the appropriate area. Lingegård et al. (2021) conducted a cross-country comparison of how policies and practices for carbon reduction develop across multiple implementation levels, and identified that the projects as either drivers of policy goals, frontrunners in industry-level development processes, or translators of national policy, depending on the policy ambitions at the national or regional level. Tilt and Ries (2021) also found that small communities can have a unique set of constraints, particularly given the limited capacity of staff, expertise, and funding to comply with these regulations, that ask closer relationships and communication. Similar conclusion did Hashmi et al. (2021) and O'Donnell et al. (2021) when analysed asymmetric nexus between urban agglomerations. Ureta et al. (2021) found that also on micro level household characteristics such as age, house ownership, experience and perception of climate change impact are significant policy adoption barriers.

The findings show that pervasive scepticism, inefficiencies, and systemic flaws represent distinct forms of scepticism apparent within the social-ecological system,

necessitating careful consideration in any state intervention efforts. This scepticism often stems from a misalignment between bottom-up stakeholder involvement and top-down goal achievement. Furthermore, the literature underscores the significance of addressing feedback delays, which impact the feasibility of sustainability initiatives. Lastly, the necessity for collaborative efforts among all system components is highlighted, emphasizing the importance of aligning governance and political frameworks, fostering public-private partnerships, and ensuring inclusive decision-making processes to overcome barriers to sustainability. These findings provide insights for policymakers and stakeholders in designing more effective strategies to address sustainability goals.

3.2. Intervention focus

In this section, we conducted the systematic review and analysis of state interventions aimed at addressing the identified problems. Specifically, we examined the focus and type of interventions implemented based on Anderies et al. (2004) social-economic system representation.

The results of the analysis of interventions' focus are depicted in Figure 5.

The analysis underscores a visible trend: a substantial majority of interventions, comprising 60.5% or 123 mentions, are directed either toward the infrastructure itself or toward strengthening its relationships with other entities. Notably, approximately one-third (30.8%) of these interventions specifically target the relationships between infrastructure managers and the infrastructure (MI), while another considerable portion (21.1%) focuses on enriching the interaction between users and the infrastructure (UI). Less frequently observed, at 8.6%, are interventions concentrating on adjusting infrastructure to changing external conditions (ERI), with an even smaller percent-age – 5.9%, addressing the impact of infrastructure on the resource level (IR).

Conversely, interventions unrelated to infrastructure primarily concentrate on changes in the political system, migration, commodity prices, regulations, and cybersecurity (13.5%). Additionally, interventions determining political recommendations linked specifically to infrastructure providers and their relationships with users account for 12.4%. Scarcer still are interventions directly addressing resource utilization (RU), representing only 7.6% of the total interventions studied.

Figure 6 presents the results of counting mentions of different types of interventions.

Figure 6a illustrates the distribution of various intervention types mentioned in the reviewed literature. "Governance", "Investments & Subsidies", and "Public participation" each exhibit a notably high frequency, each appearing at least 40 times, indicating a strong emphasis on

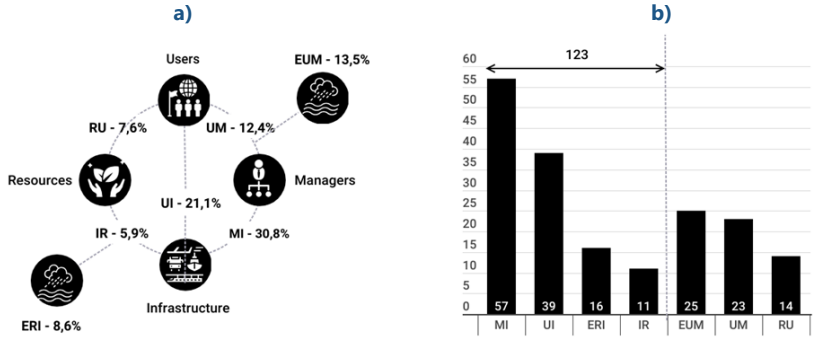


Figure 5. Focus of interventions: (a) distribution of state intervention focus (abbreviations explained in Figure 1), %; (b) distribution of intervention focus, mentions

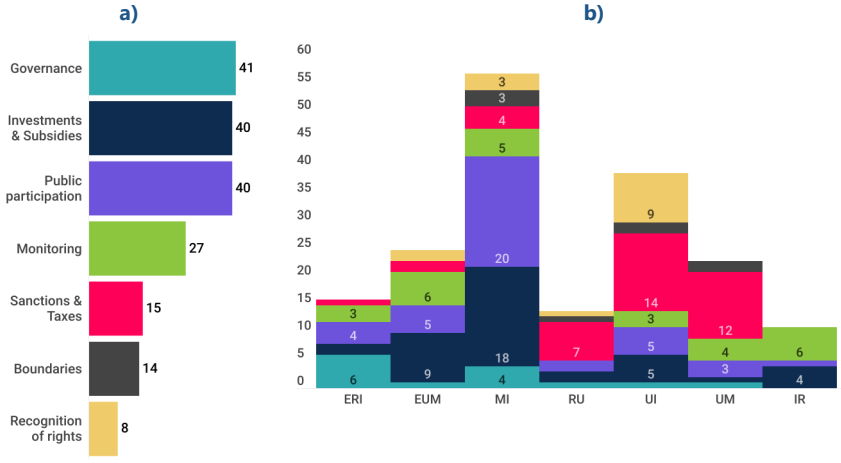


Figure 6. Distribution of intervention types' mentions in the reviewed literature: (a) distribution of intervention types; (b) application of intervention types by focus areas

these areas. "Monitoring", with 27 mentions, follows as the next most frequent type. "Sanctions & Taxes" as well as "Boundaries" are less common, appearing 15 and 14 times accordingly, while "Recognition of rights", appearing only 8 times, is the least frequent mentioned intervention type.

The mapping of types of interventions to the focus of interventions reveals distinct associations between various categories is presented on Figure 6b.

User-focused interventions are predominantly carried out using "Public participation" instruments. For instance, among the UM (User – Infrastructure Manager) focused studies, 12 out of 23 emphasize "Public participation". These studies address infrastructure needs and opportunities specific to communities (Miletic et al., 2022), community education (Barclay & Klotz, 2019), and the development of collaboration and trust (Chaffin et al., 2019), highlighting the significance of involving the public in decision-making processes. The User–Infrastructure (UI) focused studies also predominantly emphasize "Public participation", with 14 out of 39 studies highlighting this intervention type. This highlights the importance of user engagement including actors' coordination (Knodt et al., 2022; Tilt & Ries, 2021) and public-private partnerships (Merzlov, 2022; Liu et al., 2021, etc.) within this domain. However, UI is also the main system point where "Sanctions & Taxes" are addressed, as these elements are considered in 9 out of the 39 studies. Monetary interventions, such as carbon taxes (Deetjen & Azevedo, 2020), emission trading (Keenan & Gumber, 2019), and land costs (Bixler et al., 2020), expanding the spectrum of considerations within the monetary interventions field. Conversely, EUM (External conditions – User – Infrastructure) interventions predominantly align with "Governance"-related aspects (e.g., policies and the development of specific institutions), noted in 9 out of 25 studies, followed by "Monitoring" (6 out of 25) and "Investments & Subsidies" (5 out of 25) as prevalent themes.

The user-focused approach contrasts with infrastructure-oriented interventions, which are mainly implemented using "Governance" and "Investment & Subsidies" instruments. Particularly, "Governance" emerges as a significant intervention type for MI (Infrastructure Managers – Infrastructure) focus, cited in 18 out of 57 sources focused on this matter. These sources primarily discuss actions mandated for local administrations (Tiwari et al., 2021) and the utilization of information technology to ensure cohesion among various infrastructure governance systems (Mishra et al., 2021). Moreover, recent literature highlights the MI focus in conjunction with "Investments & Subsidies" (20 out of 57) and the complex nature of benefit assessments, considering indirect actions (Lech & Pawel, 2020), spatial distributions (Williams & Grafton, 2019), and other influencing factors.

The interventions categorized under IR (Infrastructure – Resource) primarily intersect with "Monitoring" (6) and "Governance" (4) dimensions, signifying the importance of selecting appropriate indicators (Wilbanks et al., 2020), employing toolsets to assess the impact of potential measures (Wu, 2020), fast-tracking adaptation planning (Mirti & Hawken, 2020), and similar interventions.

Finally, External conditions – Resources – Infrastructure (ERI) focused interventions primarily revolve around "Boundaries"-related considerations, a central point highlighted in 6 out of 16 studies. This underscores the significance of contingency management (Ganter et al., 2020; Morshedlou et al., 2018) in securing optimal results in infrastructure governance amid evolving external circumstances.

To summarize the findings in this section, interventions predominantly focus on either the infrastructure itself or its associated relationships. "Governance" and "Investments & Subsidies" emerge as key themes in infrastructure-oriented interventions. In contrast, "Public participation" is the dominant theme in user-oriented interventions.

4. Discussions

To address the previously identified research gap, this study investigates and classifies the concerns of entrepreneurs, evaluates the effectiveness of state policies in mitigating these issues, and maps the most effective incentives corresponding to each category of concern. The following findings are structured to reflect these objectives. The analysis of internal barriers towards sustainability highlighted pervasive scepticism, inefficiencies, and systemic flaws within the social-ecological system. These barriers underscore the importance of carefully considering state intervention efforts. Currently we observed a trend where most interventions focused on either the infrastructure itself or on enhancing its relationships with other entities. "Governance", "Public Participation", and "Investments & Subsidies" emerge as the predominant types of interventions, with significantly fewer explorations into other intervention types.

Following the PICO methodology, we have attempted to identify the effectiveness of the applied interventions, but found that in social studies, it is not common practice to publish null hypothesis (C) and outcomes of studies (O). In 12 out of the 185 studies reviewed, results of provided interventions were not provided. Additionally, critical discussions indicating possible failures of provided interventions were only provided in 15 studies.

Figure 7 illustrates the interventions' effects addressing a specific barriers' category.

"Public Participation" and "Governance" emerged as the most employed interventions addressing general "Scepticism", with 10 and 6 out of 25 studies respectively. Notably, concerns about the results of implementation were only reported from these most mentioned types of interventions. Interventions related to monetary incentives, such as "Investments & Subsidies" and "Sanctions & Taxes", were second best effective in combating general "Scepticism".

"Investments & Subsidies" (I&S) and "Monitoring" were mentioned equally frequently in more than half of

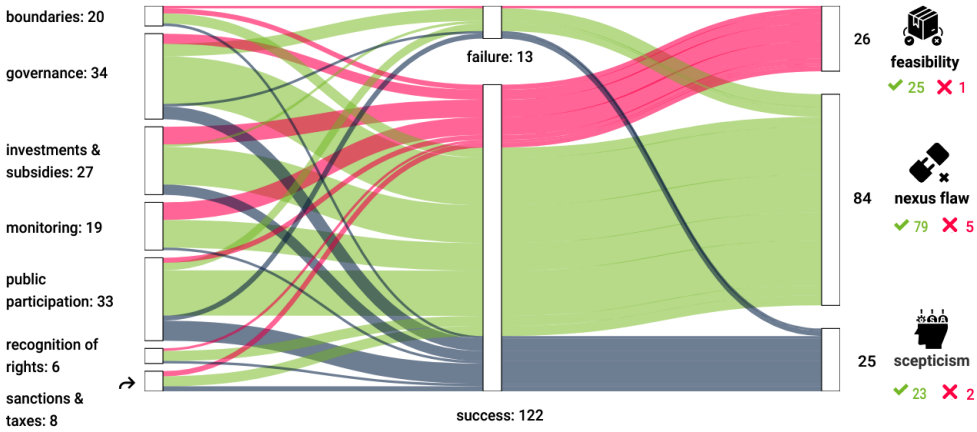


Figure 7. Success rates of different interventions in overcoming various categories of barriers to achieving ESG goals, as mentioned in the reviewed studies

the studies reporting positive results in addressing this group of barriers, with 7 and 7 out of 25 positive results respectively. Only one study reported unsuccessful results in "Feasibility" group when discussing "Boundaries", while all other studies reported successful outcomes.

"Public Participation" and "Governance" were also frequently used interventions addressing flaws, with 21 and 24 out of 84 studies respectively. In this group, similar to the aforementioned, concerns were raised in these types of interventions, with 3 and 5 negative results respectively. Effective results in this group were more frequently reported in "Investments & Subsidies" and "Monitoring", with 15 and 11 studies out of 75 reporting positive results respectively.

A similar pattern emerged when analyzing the focus of interventions (Figure 8).

The most frequently mentioned groups of focus, namely "Managers & Infrastructure" (MI), "Users & Infrastructure" – UI, and "Managers & Users" – MU, also reported the most negative results. This suggests that these types of interventions are likely the most extensively explored in the literature. Another interpretation is that interventions focusing on human involvement tend to encounter more implementation difficulties compared to those targeting physical infrastructure and/or resources.

The outcomes derived from the discussion part underscore the pervasive scepticism, inefficiencies, and systemic flaws within the social-ecological system, emphasizing the need for careful consideration in state intervention efforts. The predominant types of interventions, including "Governance", "Public Participation", and "Investments & Subsidies", emerge as key strategies to address these barriers, although there are significantly fewer explorations into other intervention types. Furthermore, interventions focusing on human involvement, tend to encounter more implementation difficulties compared to those targeting physical infrastructure or resources. Overall, these findings provide valuable insights for future research and policy interventions aimed at overcoming barriers to sustainability.

5. Conclusions

A key contribution of this study lies in its novel mapping of entrepreneurial concerns to the most effective categories of public policy incentives, providing a clearer picture of which interventions serve as the most efficient tool for specific challenges. This evidence-based approach helps to address the critical need for causal clarity in the design of sustainability policies, especially in light of their often substantial costs. By highlighting where misalignments

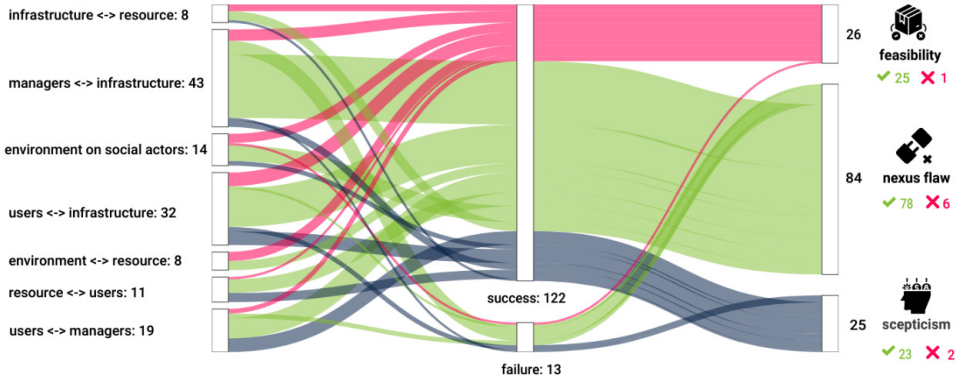


Figure 8. Success rates of different focus of interventions in overcoming various categories of barriers to achieving ESG goals, as mentioned in the reviewed studies

persist and where interventions are most impactful, the study offers actionable insights for policymakers aiming to enhance the efficiency, responsiveness, and strategic direction of public sustainability initiatives.

The reviewed studies identify several barriers to sustainability, categorized into three groups based on principles derived from complex systems theory:

- Nexus flaw or general belief that certain parts of a system are overburdened, leading to doubts about fairness and effectiveness was addressed in 64%. It encompasses issues of governance, lack of collaboration, and misalignments between costs and benefits. Studies emphasize the importance of long-term perspectives and better integration of different stakeholders' plans and goals. Addressing these systemic issues requires public-private partnerships, inclusive decision-making, and policies that consider interdependencies among different actors within the system. These findings contribute to existing evidence suggesting that overcoming the nexus flaw requires inclusive governance, transparent communication, and policies that recognize and address both technical and social dimensions of sustainability (Di Felice et al., 2024; Javan et al., 2025)
- Lack of feasibility was highlighted as a significant barrier in 18% of the studies. The literature discusses how delays in decision-making and scale inefficiencies can complicate the implementation of sustainable projects. However, informed decision-making, increased incentives, and economic strategies like contract-based resilience can mitigate these challenges. Addressing the impact of vulnerabilities, especially in access to critical facilities during disasters, is also crucial for long-term resilience. These supports recent evidence summarised in meta-analysis of Mohseni and Brent (2025) showing that integrated planning, capacity building, and targeted incentives are key to making sustainable practices more achievable and widespread,
- Scepticism was identified in 17% of studies, emphasizes the necessity for coordination between different system elements, such as "bottom-up" stakeholder engagement and "top-down" policy enforcement. The specific practices for overcoming scepticism have been explored primarily within urban and educational contexts by Araci et al. (2025) and Melichová and Hrivnák (2025), but remain underexamined in other fields. This gap presents an opportunity for future research. Overall, the identified barrier groups underscore the complexities of achieving sustainability, emphasizing the need for coordinated efforts, effective communication, and inclusive governance.
- The review of state interventions addressing identified barriers reveals several key trends:
- The majority (60.5%) focus on improving infrastructure or its relationships with the system. This includes infrastructure management, improving users' behaviour on usage of infrastructure, adapting infrastructure to external conditions and managing infrastructure's effect on resources. "Governance" and "Investments & Subsidies" are prominent themes in infrastructure-oriented interventions, whereas "Public participation" is the focus in user-oriented interventions. These findings directly inform and guide the next stages of the research agenda: (1) identifying effective incentive mechanisms, in contexts where investments and subsidies are limited, as well as examining how different types of incentives can be combined for greater impact; (2) exploration of the secondary effects of incentivising sustainable practices, such as the risk of the potential increase of poverty or regional inequality.

The mapping analysis discloses that "Public Participation" and "Governance" are the most frequently employed interventions for addressing general skepticism and flaws, although they are also associated with reported concerns about implementation outcomes; meanwhile, "Investments & Subsidies" and "Monitoring" are notably effective, with high frequencies of positive results in overcoming feasibility and systemic flaws. The most frequently mentioned focuses of interventions ("Managers – Infrastructure" (MI), "Users – Infrastructure" (UI), and "Managers – Users" (MU)) reported the highest proportion of negative results, indicating that these interventions are extensively explored and have already visible outcomes for discussions.

Our review demonstrates that, although the PICO methodology can significantly enhance the formulation of research questions and the identification of relevant evidence in social science, many studies still fail to clearly articulate the problems addressed by interventions, rarely report failures, and often do not explore alternative approaches. These gaps suggest a need for more rigorous application of the PICO or other systematic framework in social science to improve the quality and transparency of research in this field.

Several additional limitations should be acknowledged. First, the reliance on the Scopus database and the inclusion of only English-language publications may have led to the exclusion of relevant studies, especially case studies of small states, introducing potential search and language bias. Additionally, publication bias remains a concern, as studies with negative are underreported or unpublished, as reported in Figure 8. Methodologically, variations in study quality, definitions, and measurement approaches can hinder comparability and synthesis. While efforts were made to apply consistent inclusion criteria, some subjectivity in the screening and interpretation process is inevitable, given the limited number of reviewers involved. Lastly, the exclusion of grey literature and the challenges in synthesizing heterogeneous data without a meta-analysis may restrict the comprehensiveness of the conclusions.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used ChatGPT, an AI language model, to improve the readability and language of the manuscript. After using this tool, the authors reviewed and edited the content as needed and takes full responsibility for the content of the published article.

Author contributions

Author 1: conceptualization, data curation, formal analysis, investigation, writing – original draft. Author 2: methodology, visualization, formal analysis, writing – review and editing. Author 3: project administration, resources, software, funding acquisition, supervision. Author 4: validation.

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APPENDIX

Table A1. Definitions of types of interventions (source: based on Ostrom, 1990)

Type of interventions	Explanations
Boundaries	The boundaries of the resource system (e.g., irrigation system or fishery) and the individuals or households with rights to harvest resource units are clearly defined.
Subsidies and investments	Rules specifying the amount of resource products that a user is allocated are related to local conditions and to rules requiring labor, materials, and/or money inputs.
Public participation	Users and their officials have rapid access to low-cost, local arenas to resolve conflict among users or between users and officials. Most individuals affected by harvesting and protection rules are included in the group who can modify these rules. PPP. Education and promotion among users.
Monitoring	Monitors, who actively audit biophysical conditions and user behavior, are at least partially accountable to the users or are the users themselves.
Sanctions and taxations	Users who violate rules-in-use are likely to receive graduated sanctions (depending on the seriousness and context of the offense) from other users, from officials accountable to these users, or from both. Differentiations of charges and fees. Emission trading programs.
Recognition of Rights	The rights of users to devise their own institutions are not challenged by external governmental authorities, and users have long-term tenure rights to the resource.
Governance	Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers.