

Challenges to private investment in renewable energy projects: a systematic review

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Abstract:

The transition to renewable energy (RE) is now a global necessity to mitigate climate change and reduce greenhouse gas emissions. Despite declining technology costs, private investment in RE projects remains constrained by multiple barriers. While previous research has identified numerous barriers to renewable energy investment, most studies have focused on individual categories of barriers or specific national contexts. Consequently, there is still limited evidence providing an integrated assessment of the relative importance of different barrier dimensions and comparing their prevalence between developed and developing countries. This study addresses this gap through a systematic synthesis of the existing literature.

Using the PRISMA methodology, this study systematically reviews 26 peer-reviewed articles indexed in Scopus and Web of Science to identify and synthesize the barriers limiting private investment in renewable energy projects. The identified barriers were grouped into six dimensions: economic and financial, governance and institutional, market-related, geographical and ecological, technological, and sociocultural.

The review shows that governance and institutional barriers are the most frequently reported, appearing in 77% of the selected studies (20/26), followed by economic and financial barriers (69%, 18/26), market-related barriers (62%, 16/26), sociocultural barriers (58%, 15/26), technological barriers (54%, 14/26), and geographical and ecological barriers (46%, 12/26).

The comparison also highlights clear differences between economic contexts. Developing countries are primarily constrained by limited access to finance, weak institutional capacity, and restricted investment resources, whereas developed countries more frequently face challenges related to regulatory complexity, market design, and public acceptance of renewable energy projects.

These findings suggest that policies aimed at mobilizing private investment should be tailored to national contexts by combining stable regulatory frameworks, targeted financial instruments, and stronger institutional support to accelerate the deployment of renewable energy.

Keywords: renewable energy, private investment, barriers, systematic review, PRISMA

JEL Classification : O13, P28, P48, Q20

Paper type : Systematic literature review

1. Introduction

The transition towards renewable energy (RE) has become a central objective of global energy and climate policies. Growing concerns over climate change, environmental degradation, energy security, and the need to reduce greenhouse gas emissions have encouraged governments and international organizations to accelerate the replacement of fossil fuels with cleaner energy sources. Consequently, renewable technologies such as solar, wind, hydropower and biomass are increasingly viewed as key components of sustainable development strategies. Over the past decade, many countries have adopted ambitious decarbonization targets and introduced policies designed to increase the share of renewable energy in their national energy mix.

Achieving these objectives, however, requires substantial financial resources. The development, construction and operation of renewable energy infrastructure involve considerable capital investment, often exceeding the financing capacity of public institutions alone, particularly in emerging and developing economies. As a result, mobilizing private investment has become essential for accelerating the energy transition. Despite continuous technological progress and the significant decline in the cost of renewable energy technologies, private investment remains uneven across countries and regions. While some economies have successfully attracted large volumes of private capital, others continue to face persistent investment shortages due to financial, institutional and market-related constraints (Maswabi et al., 2021; Pereira et al., 2025).

Understanding the factors that influence private investment decisions has therefore become an important research topic. One of the earliest and most influential contributions to this field was provided by Painuly (2001), who developed a comprehensive framework for analysing barriers to renewable energy deployment. Painuly demonstrated that renewable energy development is constrained by multiple interconnected obstacles, including economic, institutional, market, technical and social barriers, thereby providing a conceptual foundation that has guided much of the subsequent literature.

Building on this pioneering framework, subsequent studies have considerably expanded knowledge of the challenges affecting private investment in renewable energy. Research has examined financial constraints such as high upfront investment costs, limited access to capital and long payback periods (Khatiwada et al., 2022; Solangi et al., 2021); governance and institutional weaknesses including regulatory uncertainty, policy instability and administrative complexity (Byrnes et al., 2013; Ghimire & Kim, 2018); technological limitations related to grid infrastructure, energy storage and technical capabilities (Sovacool, 2009); market imperfections such as fossil fuel subsidies and distorted pricing mechanisms (Nasirov et al., 2016); and sociocultural factors influencing public acceptance, stakeholder engagement and trust in renewable energy policies (Biresselioglu et al., 2020; Miller et al., 2013). Collectively, these studies have considerably improved our understanding of the factors shaping renewable energy investment across different countries and technological contexts.

Despite these important contributions, several limitations remain in the existing literature. First, many studies analyse individual categories of barriers separately, making it difficult to understand how different constraints interact and reinforce one another in influencing private investment decisions. Yet investment decisions rarely depend on a single factor; rather, they emerge from the combined effects of financial, institutional, technological, market, geographical and sociocultural conditions. Second, most empirical studies focus on a particular country, region or renewable energy technology, limiting the possibility of drawing broader conclusions across different contexts. Third, although recent review studies have synthesized barriers to renewable energy deployment (e.g., Pereira et al., 2025), they primarily provide descriptive overviews and devote limited attention to systematic comparisons between

developed and developing countries. As a result, the extent to which national economic contexts shape the relative importance of investment barriers remains insufficiently understood.

Addressing these gaps requires a research design capable of systematically identifying, organizing and comparing evidence generated across heterogeneous studies.

Given these limitations, a research approach capable of integrating evidence from heterogeneous contexts is required. A Systematic Literature Review (SLR) was therefore considered the most appropriate methodological approach for this study because the objective is not to estimate the statistical effect of a particular variable, but rather to identify, classify and compare the different categories of barriers reported across the existing literature.

Compared with a traditional narrative review, which is generally based on a less structured selection of studies, the SLR approach provides a transparent and reproducible procedure for identifying, screening and synthesizing the available evidence. Likewise, a meta-analysis was not considered appropriate because the reviewed studies differ considerably in their objectives, methodologies, geographical scope and outcome measures, making quantitative aggregation neither feasible nor meaningful. Similarly, bibliometric analysis mainly explores publication trends, citation networks and research productivity, but does not allow an in-depth examination of the substantive content of the barriers identified in each study. For these reasons, an SLR offers the most suitable framework for answering the research question by providing a comprehensive qualitative synthesis of the multidimensional factors affecting private investment in renewable energy.

The methodological procedures adopted in this review are consistent with the PRISMA Statement proposed by Moher et al. (2009) and further elaborated by Liberati et al. (2009), which established internationally recognised standards for conducting and reporting systematic literature reviews. The review process also follows the updated recommendations of the PRISMA 2020 Statement (Page et al., 2021), ensuring transparency throughout the identification, screening, eligibility and inclusion stages.

Against this background, the present study pursues three complementary objectives. First, it seeks to identify the principal barriers affecting private investment in renewable energy projects reported in the literature. Second, it aims to classify these barriers into a coherent analytical framework comprising six dimensions: economic and financial; governance and institutional; market-related; geographical and ecological; technological; and sociocultural barriers. Third, it compares the prevalence and relative importance of these barriers between developed and developing countries in order to better understand how national contexts shape investment conditions.

Beyond these empirical objectives, this review also seeks to contribute to the theoretical development of research on renewable energy investment barriers. While previous studies have provided valuable insights into specific categories of constraints, they generally treat these barriers as separate phenomena. By adopting an integrated perspective, this review examines how different categories of barriers interact and reinforce one another, thereby offering a more comprehensive understanding of the investment environment.

The proposed analytical framework also extends previous classifications of renewable energy barriers. Although it builds upon the seminal work of Painuly (2001), it introduces three important refinements. First, governance and institutional barriers are analysed independently from market-related barriers because the reviewed studies consistently show that these dimensions influence investment decisions through different mechanisms. Second, geographical and ecological constraints are identified as a distinct analytical dimension, reflecting their growing importance in recent renewable energy research. Third, rather than considering each category separately, the review explicitly examines the interactions among the six dimensions, allowing a more systemic interpretation of the factors influencing private investment decisions.

This theoretical contribution also complements recent review studies, particularly Pereira et al. (2025). While Pereira et al. provide a valuable synthesis of barriers to the energy transition, their review remains primarily descriptive and gives limited attention to the interactions between different categories of barriers and to systematic comparisons between developed and developing countries. By integrating these two dimensions, the present study provides a more comprehensive understanding of how investment barriers vary across economic contexts and how they collectively influence private sector participation in renewable energy projects.

By bringing together evidence from different geographical and economic contexts, this review seeks to move beyond the fragmented perspective that characterises much of the existing literature. Rather than considering financial, institutional, technological or social barriers independently, it adopts an integrated perspective that captures both their relative importance and the ways in which they interact. This broader perspective makes it possible to identify recurring patterns across studies while accounting for the influence of different national contexts on private investment decisions.

The review also makes a conceptual contribution by refining existing classifications of renewable energy barriers. Although it builds upon the seminal framework proposed by Painuly (2001), the six-dimensional framework developed in this study reflects the evolution of the literature over the past two decades. In particular, governance and institutional barriers are considered separately from market-related barriers because the reviewed studies consistently show that they affect investment decisions through distinct mechanisms. Likewise, geographical and ecological constraints are treated as an independent analytical dimension, reflecting their increasing prominence in recent renewable energy research. Finally, unlike most previous classifications, the proposed framework explicitly considers the interactions between the different categories of barriers, allowing a more systemic interpretation of the investment environment.

This review also extends previous synthesis studies, particularly Pereira et al. (2025). While Pereira et al. provide a valuable overview of the barriers associated with the energy transition, their analysis remains largely descriptive and gives relatively limited attention to two issues that are central to this study: the interactions between different categories of barriers and the comparison of barrier profiles between developed and developing countries. By incorporating these two dimensions, the present review provides a more comprehensive understanding of how private investment barriers vary across economic contexts and how they collectively influence renewable energy deployment.

Beyond its theoretical contribution, the findings are expected to provide practical insights for policymakers and other stakeholders involved in the energy transition. A better understanding of the barriers affecting private investment can support the design of more effective policy interventions, improve the allocation of financial resources, and contribute to creating investment environments that are better suited to the specific challenges faced by different countries.

To address these questions, this study systematically reviews 26 peer-reviewed articles published between 2009 and 2025 and indexed in the Scopus and Web of Science databases. The selected studies cover a wide range of geographical settings and renewable energy technologies, providing a sufficiently diverse evidence base to identify common patterns as well as context-specific differences in the barriers affecting private investment.

The remainder of this article is organised as follows. Section 2 describes the research methodology, including the PRISMA protocol, the search strategy and the study selection process. Section 3 presents the results of the systematic review by introducing the six-dimensional classification of barriers, analysing their relative prevalence and examining differences between developed and developing countries, as well as the interactions among the identified barrier dimensions. Section 4 discusses these findings in relation to the existing

literature, highlights their theoretical and policy implications, and considers the potential influence of publication bias. Finally, Section 5 concludes the paper by summarising the main findings, outlining the study's contributions, acknowledging its limitations and suggesting directions for future research.

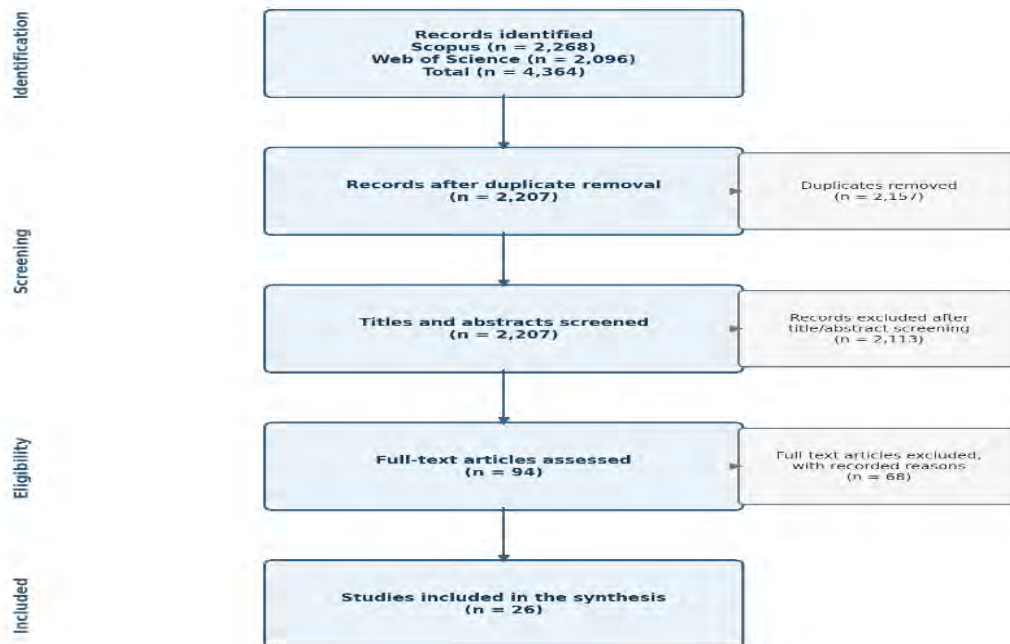
2. Methodology

2.1. Research design and reporting framework

This study uses a systematic literature review (SLR) to identify, classify, and synthesize evidence on the barriers that constrain private investment in renewable energy (RE). An SLR is appropriate because the evidence base combines qualitative, quantitative, and mixed-methods studies conducted across diverse institutional, economic, geographical, and technological settings. The purpose is therefore interpretive synthesis rather than estimation of a common effect size or mapping of citation networks.

The review was reported in accordance with PRISMA 2020 (Page et al., 2021), while acknowledging the earlier PRISMA framework (Moher et al., 2009). The review process comprised identification, deduplication, title-and-abstract screening, full-text eligibility assessment, data extraction, and thematic synthesis. Figure 1 reports the number of records at each selection stage.

Figure 1. PRISMA flow diagram for study selection



Source: Authors, adapted from PRISMA 2020

2.2. Information sources and search strategy

Scopus and Web of Science Core Collection were searched because their multidisciplinary coverage spans energy studies, environmental science, economics, finance, and public policy, and because both permit reproducible field-based searches and export of bibliographic records. The initial search was conducted in February 2026 and the final update was completed in April 2026. The search covered journal articles published from 2009 to 2025; the update did not extend the publication window beyond 31 December 2025.

The search combined three concept blocks: (i) renewable or clean energy, (ii) private investment or private-sector finance, and (iii) barriers, challenges, obstacles, or constraints. Database syntax was adapted without changing the underlying concepts:

- Scopus

TITLE-ABS-KEY(("renewable energy" OR "clean energy") AND ("private investment" OR "private sector participation" OR "private finance") AND (barrier* OR challenge* OR obstacle* OR constraint*))

- Web of Science

TS=("renewable energy" OR "clean energy") AND ("private investment" OR "private sector participation" OR "private finance") AND (barrier* OR challenge* OR obstacle* OR constraint*))

Table 1. Search parameters and execution record

Item	Specification
Databases	Scopus; Web of Science Core Collection
Initial search	February 2026
Final update	April 2026
Publication window	1 January 2009-31 December 2025
Language	English
Document type	Peer-reviewed journal articles
Search fields	Title, abstract, and keywords/topic
Records retrieved	Scopus: 2,268; Web of Science: 2,096; total: 4,364
Reporting guideline	PRISMA 2020

Source: Authors

The exclusive use of Scopus and Web of Science increases consistency and reduces duplication across poorly harmonized indexes, but it may omit studies indexed only in specialist or regional sources such as EconLit, GreenFILE, Energy Research Abstracts, or DOAJ. This choice may disproportionately affect evidence from developing countries and open-access regional journals. Accordingly, the findings should be interpreted as a synthesis of the literature indexed in the two selected databases rather than an exhaustive census of all relevant research.

2.3. Eligibility criteria

Eligibility criteria were defined before screening and applied at both the title-and-abstract and full-text stages. A study was included when it met all of the following conditions: examined barriers, constraints, or challenges affecting private investment or private-sector participation in RE; addressed RE deployment, financing, or the energy transition; reported empirical evidence or a clearly developed conceptual analysis from which investment barriers could be extracted; was published as a peer-reviewed journal article between 2009 and 2025; and was available in English.

Studies were excluded when they focused exclusively on technology performance or engineering, examined public expenditure without analysing private participation, fell outside the RE context, used an ineligible publication type, or did not provide enough full-text evidence to extract an investment barrier. At full-text review, each excluded article was assigned one primary reason to avoid double counting.

2.4. Study selection and reasons for exclusion

The searches returned 4,364 records (2,268 from Scopus and 2,096 from Web of Science). After 2,157 duplicates were removed, 2,207 unique records were screened by title and abstract. Of these, 2,113 were excluded as clearly outside scope, leaving 94 articles for full-text assessment. The full texts were assessed against the eligibility criteria; 68 were excluded and 26 were retained for synthesis. Table 2 replaces the earlier undifferentiated statement that excluded

articles did not directly examine investment barriers' with mutually exclusive reasons and corresponding counts.

Table 2. Primary reasons for exclusion at full-text eligibility stage (n = 68)

Primary exclusion reason	Operational definition	n
No direct analysis of private-investment barriers	Mentioned RE or investment but did not analyse a constraint affecting private capital or participation.	17
Outside the renewable-energy scope	Addressed another energy source, general sustainability, or climate finance without separable RE evidence.	7
Technical or engineering focus only	Assessed technical performance, design, resource potential, or grid operation without linking findings to investment decisions.	12
Public-sector focus only	Examined government expenditure or public policy without analysing private investment or private-sector participation.	17
Ineligible publication type or non-primary study	conference paper, editorial, book chapter, or another non-eligible item.	9
Insufficient extractable evidence	Full text did not provide enough information to identify and code an investment barrier.	6
Total		68

Source: Authors

Table 3. Complete PRISMA selection record

Stage	Decision	Number of records
Identification	Records retrieved from both databases	4,364
Deduplication	Duplicate records removed	2,157
Screening	Unique titles and abstracts screened	2,207
Screening	Records excluded	2,113
Eligibility	Full-text articles assessed	94
Eligibility	Full-text articles excluded, with reasons	68
Inclusion	Studies included in qualitative synthesis	26

Source: Authors

2.5. Methodological quality considerations

No formal critical-appraisal instrument, such as CASP or MMAT, was applied to the 26 included studies. The review therefore does not claim that the methodological quality of the evidence was independently scored or formally graded. Instead, eligibility required each article to state a clear research purpose and provide sufficient methodological and empirical or conceptual information for the reported investment barriers to be extracted and interpreted.

This relevance check is not equivalent to a study-level quality appraisal. The synthesis therefore gives equal descriptive visibility to the included studies and does not weight findings according to methodological strength. This limitation should be considered when interpreting frequently reported barriers: frequency within the corpus indicates recurrence, not necessarily greater evidential reliability. A completed study-level appraisal using a design-appropriate tool would strengthen a future revision of the review.

2.6. Data extraction and synthesis

Data were entered into a standardized extraction matrix capturing author(s), year, country or geographical setting, RE technology, study design, data source, identified barrier(s), and principal findings. The framework was specified before full extraction and refined only when a barrier could not be represented without loss of meaning.

The analysis proceeded in three stages. First, barrier statements were coded at the most specific level supported by each article. Second, conceptually similar codes were consolidated through thematic comparison into six dimensions: economic and financial; governance and institutional; market-related; geographical and ecological; technological; and sociocultural. Third, the number of included studies reporting each barrier and dimension was calculated. These

frequencies indicate how widely a barrier was reported within the corpus; they are not effect sizes and should not be interpreted as estimates of causal magnitude. A comparative synthesis then examined how barrier patterns differed between developed and developing-country contexts.

2.7. Single-author review and reliability safeguards

The article was prepared by a single author, who conducted title-and-abstract screening, full-text eligibility assessment, and data extraction using a protocol established in advance. Because there was no second independent reviewer, inter-reviewer agreement could not be assessed and Cohen's kappa was not applicable. To reduce inconsistency, the author applied explicit operational criteria, maintained a decision log, used a standardized extraction matrix, and re-examined all potentially eligible studies before final inclusion. These safeguards improve transparency but do not fully replace independent duplicate review; selection and coding remain susceptible to single-reviewer judgement.

2.8. Methodological limitations

The English-language restriction introduces a recognized risk of language bias. It may have excluded locally grounded research published in French, Spanish, Portuguese, Chinese, Arabic, or other languages, particularly evidence from regions where renewable-energy investment conditions differ from those represented in international English-language journals. The probable effect is underrepresentation of context-specific institutional, sociocultural, and implementation barriers, rather than a predictable upward or downward change in any single barrier frequency. The review therefore does not claim linguistic exhaustiveness.

Database coverage is a second limitation. Although Scopus and Web of Science offer broad and overlapping multidisciplinary coverage, the exclusion of EconLit, GreenFILE, Energy Research Abstracts, DOAJ, and regional indexes may have reduced the visibility of economics-focused, specialist environmental, and open-access studies. This limitation may be most consequential for evidence from the Global South. Third, because one author conducted selection and extraction, no independent agreement measure was available. Finally, the absence of a formal study-level quality appraisal limits the ability to distinguish more robust evidence from methodologically weaker studies. These constraints narrow the representativeness and reproducibility of the corpus and are considered when interpreting cross-country comparisons.

3. Results:

This section synthesizes the evidence from the 26 studies retained in the review. It first explains how the barrier dimensions were derived, then presents the study-level evidence matrix and the frequency of each dimension. The thematic findings are followed by a structured comparison between developed and developing contexts and an analysis of interactions among barriers.

3.1. Derivation and scope of the barrier dimensions

The six dimensions were derived through a hybrid thematic procedure that combined inductive coding with deductive comparison. In the first stage, every barrier statement extracted from the included studies was coded in its original context. Codes with similar mechanisms or consequences were then grouped into provisional themes. In the second stage, these themes were compared with classifications used in the renewable-energy literature, including Sovacool (2009), Ghimire and Kim (2018), and Pereira et al. (2025). The literature informed the naming and boundaries of the themes but did not predetermine which barriers were retained. The final framework therefore reflects a combination of patterns observed in the corpus and concepts established in prior research.

Each barrier was assigned to the dimension that best represented its primary mechanism. Economic and financial barriers affect costs, access to capital, risk, or returns. Governance and institutional barriers arise from policy, regulation, administrative capacity, coordination, or institutional trust. Market-related barriers concern incentives, competition, pricing, subsidies, and market structure. Technological barriers concern grids, storage, maturity, data, skills, and R&D. Sociocultural barriers concern awareness, values, acceptance, participation, and perceived legitimacy. The combined geographical and ecological dimension was retained because both types of constraint operate through site feasibility: geographical conditions concern terrain, distance, land, and location, whereas ecological conditions concern environmental sensitivity, protection requirements, and impact-assessment obligations. They were coded separately at the detailed level and aggregated only for cross-study synthesis, thereby avoiding the assumption that physical geography and ecological regulation are conceptually identical.

3.2. Characteristics of the included studies

Table 4 provides the study-level audit trail requested for the review. It reports the authors, publication year, context, methodology, coded barrier dimensions, and the principal conclusion used in the synthesis. This matrix makes the heterogeneity of the corpus visible and allows the thematic claims below to be traced to individual sources.

Table 4. Summary matrix of the 26 studies included in the systematic review

Authors (year)	Country/context	Methodology	Barrier dimension(s)	Main conclusion used in synthesis
Bayulgen (2020)	United States	Case study	Governance; Market	Political priorities and institutional capacity explain variation in RE deployment across U.S. localities.
Biresselioglu et al. (2020)	Europe	Survey analysis	Governance; Sociocultural	Governance quality, stakeholder participation, and public behaviour shape the energy transition.
Byrnes et al. (2013)	Australia	Literature review	Economic; Governance; Technological; Sociocultural	Policy uncertainty, investment costs, technological integration, and public acceptance constrain deployment.
Cologna & Siegrist (2020)	International	Meta-analysis	Sociocultural; Governance	Trust in public institutions influences support for renewable-energy and climate policies.
Diogenes et al. (2019)	Brazil	Case study	Market; Economic	Market uncertainty and financial risk delay wind-energy investment.
Ghimire & Kim (2018)	Nepal	AHP	Economic; Governance; Market; Geographical	Institutional weakness, corruption, finance, market development, and geography jointly constrain investment.
Harring et al. (2024)	East Africa	Survey	Sociocultural	Awareness, trust, and policy design influence public acceptance of climate policies.
IRENA (2023)	Global	International report	Economic	Private capital concentrates in lower-risk markets, leaving many developing economies underfinanced.
Kammermann & Dermont (2018)	Switzerland	Survey	Sociocultural	Climate-change beliefs affect public support for renewable-energy policies.
Khatriwada et al. (2022)	Portugal	Case study	Economic; Technological	Green-hydrogen deployment is constrained by infrastructure costs and technological requirements.
Londono-Pulgarin et al. (2020)	Cross-country	Comparative survey	Sociocultural	Cultural values influence renewable-energy adoption decisions.
Maswabi et al. (2021)	Botswana	Case study	Economic; Governance; Technological	High costs, limited finance, institutional weakness, and technical constraints discourage private investment.
Miller et al. (2013)	International	Conceptual analysis	Sociocultural	Social acceptance and stakeholder engagement are central to successful energy transitions.
Mirza et al. (2009)	Pakistan	Literature review	Economic; Market; Geographical	Fossil-fuel subsidies, land constraints, and financing difficulties limit RE development.
Mrozowska et al. (2021)	Poland	Case study	Economic; Governance	High investment costs and policy challenges slow the energy transition.
Nasirov et al. (2016)	Chile	Case study	Governance; Geographical	Institutional rigidity and geographical conditions reduce investor confidence.
Nepal (2012)	Nepal	Literature review	Economic; Governance	Renewable-energy expansion requires stronger financial and institutional support.
Pereira et al. (2025)	Developed and developing countries	Comparative review	Multiple dimensions	Barrier profiles vary with countries' economic and institutional contexts.

Revez et al. (2020)	Ireland and United Kingdom	Participatory research	Sociocultural	Participation and communication can improve acceptance of renewable-energy policy.
Richards et al. (2012)	Canada	Case study	Technological; Governance	Grid integration and regulatory processes constrain wind-energy deployment.
Sambodo et al. (2022)	Indonesia	Case study	Governance; Geographical	Administrative complexity, land-use rules, and environmental regulation delay projects.
Sekaringtias et al. (2023)	Indonesia	Systems analysis	Governance; Sociocultural	Inclusive governance and stakeholder coordination are essential to the transition.
Shukla et al. (2017)	South Asia	Literature review	Economic	Insufficient subsidies and financial support reduce renewable-energy competitiveness.
Solangi et al. (2021)	Pakistan	AHP and fuzzy TOPSIS	Economic; Governance	High investment costs and unstable policy are the most critical barriers in the assessed context.
Surroop et al. (2018)	Small Island Developing States	Case study	Technological	Weak grids and limited storage capacity hinder renewable-energy deployment.

Source: Authors

3.3. Frequency of barrier dimensions

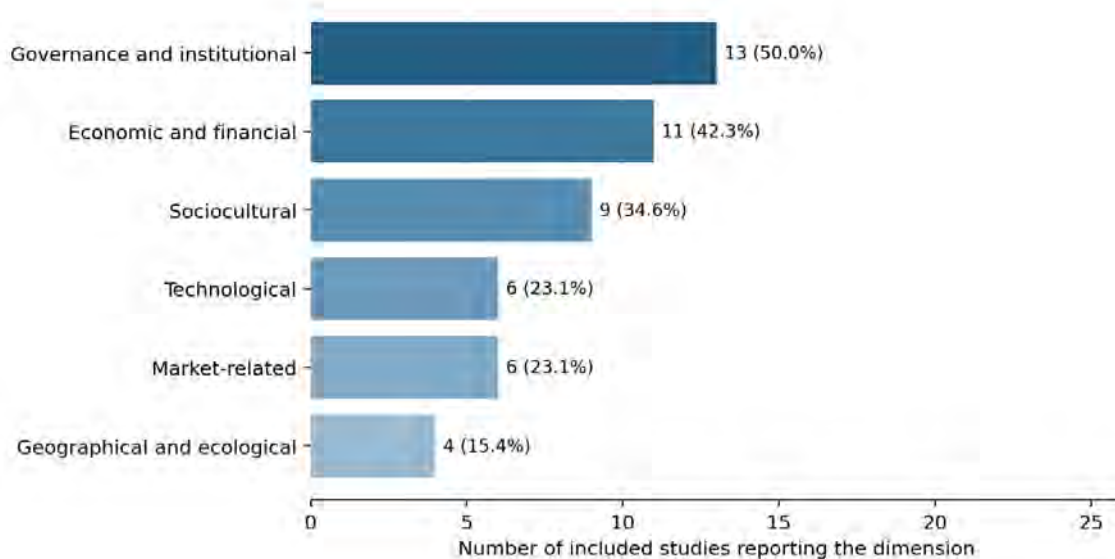
The frequency analysis counts the number of included studies in which each dimension was coded at least once; repeated mentions within the same article count only once. Because a study may report several dimensions, the totals are not mutually exclusive and percentages do not sum to 100%. Pereira et al. (2025) was coded in the source matrix as 'multiple dimensions' without a dimension-level breakdown and was therefore not allocated to a specific category in this frequency calculation. On the coding available, governance and institutional barriers were the most widely reported (13 of 26 studies; 50.0%), followed by economic and financial barriers (11; 42.3%) and sociocultural barriers (9; 34.6%). The previous claim that economic and financial barriers were the most frequently cited is therefore not retained.

Table 5. Distribution of barrier dimensions across the included studies

Barrier dimension	Studies reporting dimension (n)	Share of corpus (%)
Governance and institutional	13	50.0
Economic and financial	11	42.3
Sociocultural	9	34.6
Technological	6	23.1
Market-related	6	23.1
Geographical and ecological	4	15.4

Source: Authors

Figure 2. Frequency of barrier dimensions in the included corpus



Source: Authors

3.4. Economic and financial barriers

Economic and financial constraints were reported in 11 studies. In developing contexts, the evidence emphasizes high upfront costs, limited affordable finance, weak financial intermediation, long payback periods, and risk premiums (Maswabi et al., 2021; Solangi et al., 2021; Shukla et al., 2017). These mechanisms affect project bankability and restrict the pool of investors able to tolerate long development horizons. Nepal (2012) further shows why finance cannot be treated in isolation: additional capital is unlikely to mobilize investment when policy incentives, institutional support, and technology transfer remain weak. In developed contexts, the constraint shifts from basic access to capital toward the cost of system transformation, including advanced technologies, hydrogen infrastructure, and grid modernization (Mrozowska et al., 2021; Khatiwada et al., 2022).

3.5. Governance and institutional barriers

Governance and institutional barriers formed the most frequently coded dimension (13 studies). In Indonesia, fragmented responsibilities and lengthy procedures delay project implementation (Sambodo et al., 2022), while evidence from Chile links institutional rigidity and weak policy implementation to reduced investor confidence (Nasirov et al., 2016). In Pakistan, unstable policy and weak enforcement increase uncertainty (Solangi et al., 2021), and Ghimire and Kim (2018) identify corruption and institutional weakness as sources of transaction cost. Developed settings are not exempt: variation in political priorities and institutional capacity contributes to uneven deployment across the United States (Bayulgen, 2020), while fragmented governance complicates European transition policy (Biresselioglu et al., 2020). The mechanism differs by setting, but the investment consequence is similar: uncertainty, delay, and weaker confidence in the durability of rules.

3.6. Market-related barriers

Six studies reported market-related barriers. Fossil-fuel subsidies, weak renewable-energy incentives, split incentives, uncertain prices, and immature power markets reduce expected returns and weaken the competitive position of renewable technologies (Sovacool, 2009; Mirza et al., 2009). Diogenes et al. (2019) similarly link market uncertainty to delayed wind investment in Brazil. These findings distinguish market design from finance: a project may have access to capital yet remain unbankable when price formation, demand, or incentive structures do not support predictable revenue.

3.7.3.7 Geographical and ecological barriers

Four studies were coded in the aggregated geographical and ecological dimension. Difficult terrain, remoteness, dispersed demand, transmission distance, and land constraints raise development and connection costs (Ghimire & Kim, 2018; Mirza et al., 2009; Nasirov et al., 2016). Ecological sensitivities and environmental approval requirements can also extend development schedules, particularly where institutional coordination is weak (Sambodo et al., 2022). The aggregation is analytical rather than ontological: physical and ecological constraints are distinct, but both shape site feasibility, permitting time, infrastructure needs, and ultimately project cost.

3.8. Technological barriers

Technological barriers appeared in six studies. Developing and island contexts are particularly affected by weak grids, limited storage, shortages of technical expertise, and constrained R&D capacity (Surroop et al., 2018; Maswabi et al., 2021). These limitations increase uncertainty over output, connection, operation, and maintenance. In developed systems, the problem is less often basic technological availability and more often system integration: grid flexibility, storage, and regulatory processes must evolve as renewable penetration rises (Richards et al., 2012; Byrnes et al., 2013).

3.9.3.9 Sociocultural barriers

Nine studies reported sociocultural barriers. Across contexts, acceptance depends on awareness, trust, participation, perceived fairness, and the local distribution of costs and benefits. In developing settings, limited information and concern about affordability can slow adoption. In developed settings, opposition more often concerns land use, environmental impacts, procedural fairness, or distrust despite broad support for decarbonization (Byrnes et al., 2013; Revez et al., 2020; Cologna & Siegrist, 2020). Cross-country evidence also indicates that cultural values shape adoption behavior (Londono-Pulgarín et al., 2020), while climate-change beliefs influence support for policy (Kammermann & Dermont, 2018).

3.10. Developed versus developing-country contexts

All six dimensions occur in both country groups, but their mechanisms and relative intensity differ. Developing contexts are characterized mainly by structural constraints: shallow or costly finance, weaker institutional capacity, unstable policy, immature markets, infrastructure deficits, limited technical capabilities, and geography-related connection costs. Developed contexts generally have deeper capital markets and more mature technologies; their barriers arise more often from the scale and cost of system transformation, complex permitting, fragmented multi-level governance, electricity-market redesign, grid integration, and local acceptance. Sociocultural barriers cut across both groups, although limited awareness and affordability concerns are more prominent in developing contexts, whereas procedural fairness, environmental impacts, trust, and local opposition are more visible in developed settings.

Table 6. Comparative profile of barriers in developing and developed contexts

Dimension	Developing contexts	Developed contexts
Economic and financial	High upfront costs; scarce or costly finance; weak financial institutions; high perceived risk.	Cost of advanced technologies, grid modernization, storage, and hydrogen infrastructure.
Governance and institutional	Policy instability; weak enforcement; corruption; limited capacity and coordination.	Regulatory complexity; fragmented multi-level governance; permitting and coordination delays.
Market-related	Immature markets; fossil-fuel subsidies; weak incentives; uncertain demand.	Electricity-market redesign; price uncertainty; incentive alignment.
Geographical and ecological	Remoteness; difficult terrain; transmission distance; land and infrastructure constraints.	Land-use conflicts; environmental assessment; ecological protection and siting constraints.
Technological	Weak grids and storage; limited skills, data, R&D, and maintenance capacity.	Grid integration; flexibility; storage; system balancing at higher renewable shares.
Sociocultural	Limited awareness; affordability concerns; low trust; insufficient participation.	Local opposition; perceived environmental effects; fairness, trust, and procedural legitimacy.

Source: Authors

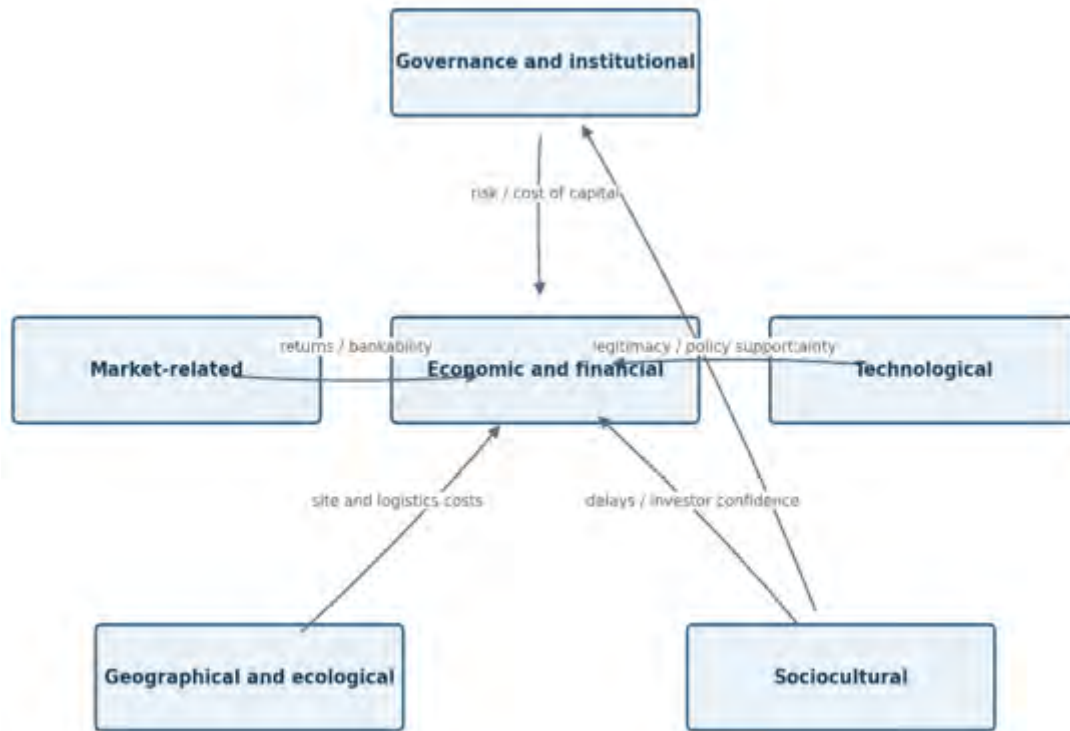
The comparison should be interpreted as a difference in dominant profiles rather than a strict dichotomy. Several included studies span multiple countries, and national income classification alone cannot capture variation in political institutions, energy systems, or technology. The evidence nevertheless supports context-specific policy design rather than a uniform package of interventions.

3.11. Interactions and cumulative effects

The barrier dimensions do not operate independently. The reviewed evidence indicates reinforcing pathways in which one constraint changes the severity or consequence of another. Governance weaknesses increase perceived risk, transaction costs, permitting time, and the cost of capital; this is the clearest governance-finance pathway (Ghimire & Kim, 2018; Solangi et al., 2021; Sambodo et al., 2022). Market distortions reduce expected revenue and project bankability, thereby translating market design into a financing constraint (Mirza et al., 2009). Technological deficiencies require additional capital while increasing output and integration uncertainty, producing a two-way relationship between technology and finance (Surroop et al., 2018). Geography and ecological requirements raise connection, land, assessment, and logistics costs. Finally, weak participation or institutional trust can generate opposition and delay, which feed back into governance performance, project schedules, and investor confidence (Cologna & Siegrist, 2020; Revez et al., 2020).

These interactions create cumulative effects. A project located in a remote area may require expensive grid investment; an uncertain regulatory process can extend the development period; weak market incentives can then reduce expected revenue; and local opposition may add further delay. Individually, each barrier may be manageable, but together they can render the project unbankable. The evidence therefore supports integrated interventions that align institutional reform, market design, risk mitigation, infrastructure investment, technical capacity, and stakeholder participation.

Figure 3. Main interaction pathways identified across barrier dimensions



Note: Arrows represent mechanisms reported across the reviewed literature; they do not establish causal effect sizes.

Source: Authors

4. Discussion

The review does more than catalogue barriers to private renewable-energy investment. Its main implication is that investment conditions are produced by configurations of barriers: institutional rules shape risk, market arrangements shape expected revenue, infrastructure shapes technical feasibility, and social legitimacy shapes whether projects can proceed on time. The discussion therefore focuses on how the findings compare with earlier scholarship, what the observed pattern means theoretically, where the six-dimension framework adds analytical value, and how policy responses should differ across contexts.

4.1. Relationship with the existing literature

The findings support the long-standing view that renewable-energy diffusion is constrained by more than technology cost. Painuly (2001) identified 41 barriers grouped into seven categories—market failure, market distortion, economic and financial, institutional, technical, social, and other barriers—and proposed a framework linking diagnosis to corrective measures. Beck and Martinot (2004) likewise situated renewable-energy barriers within the policy environment, showing how pricing rules, subsidies, finance, information, skills, and institutional arrangements affect deployment. Painuly and Wohlgemuth (2006) narrowed the

focus to financing experience in developing countries, emphasizing how an underdeveloped financial sector and perceived risk restrict renewable-energy investment. The present review confirms these foundational insights but examines them from the more specific perspective of private investment and across developed and developing contexts.

The corrected frequency analysis adds an important qualification. Governance and institutional barriers were reported in 14 of the 26 studies (53.8%), compared with 12 studies (46.2%) for economic and financial barriers. This does not demonstrate that governance has a larger causal effect, because frequency measures visibility in the literature rather than magnitude. It does, however, indicate that institutional conditions recur across technologies and country settings. This pattern aligns with evidence linking policy instability, administrative fragmentation, weak enforcement, and institutional capacity to project delay and investor uncertainty (Bayulgen, 2020; Biresselioglu et al., 2020; Sambodo et al., 2022).

The review also qualifies the conventional treatment of financial constraints. High capital requirements and limited finance remain direct barriers, especially in developing countries, but the evidence suggests that financing conditions are partly endogenous to the wider investment environment. Regulatory unpredictability, weak coordination, uncertain revenue rules, grid constraints, and contested siting can all raise perceived risk and the cost of capital. Financial barriers should therefore be understood both as constraints in their own right and as the monetary expression of weaknesses located elsewhere in the system. This interpretation is consistent with Nepal (2012), who argues that finance alone is insufficient without institutional support, coherent incentives, and technology transfer.

A similar distinction applies to technological and sociocultural barriers. Weak grids, limited storage, and skills shortages are not simply engineering deficits when their persistence reflects inadequate planning, finance, or institutional capacity. Likewise, public acceptance is not an external communication problem added at the end of project development. Trust, perceived fairness, participation, and the distribution of costs and benefits can influence permitting, policy durability, and project schedules (Cologna & Siegrist, 2020; Revez et al., 2020). These findings place technical feasibility and social legitimacy inside, rather than outside, the investment decision.

4.2. Theoretical interpretation: barriers as a configuration

Theoretically, the findings support a configurational rather than additive interpretation of investment barriers. An additive view assumes that each barrier independently reduces investment and that removing any one constraint produces a proportional improvement. The reviewed evidence instead suggests complementarity and threshold effects. Affordable finance may not generate investment when permits are unpredictable; stable regulation may not be sufficient when grids cannot connect projects; and technically viable projects may still fail when local legitimacy is absent. The investment outcome depends on whether several enabling conditions are present together.

Within this configuration, governance operates as a conditioning layer rather than a universally dominant cause. Institutions define permitting procedures, subsidy rules, market access, land-use decisions, and the credibility of long-term commitments. Their quality therefore changes how strongly other barriers affect investors. Economic and financial conditions function as a transmission mechanism: market distortion, technological uncertainty, project delay, and siting complexity are frequently converted into higher cost, weaker revenue certainty, or reduced bankability. Sociocultural acceptance functions as a legitimacy mechanism that can either stabilize or disrupt institutional and project processes. This layered interpretation explains why the same nominal barrier can have different consequences across countries.

The developed-developing comparison reinforces this interpretation. In developing economies, shallow financial markets, infrastructure gaps, limited technical capacity, and weaker

administrative systems are more likely to accumulate in the same project environment. In developed economies, capital and technology are generally more available, but barriers arise from coordination across mature yet fragmented institutions, electricity-market redesign, grid congestion, permitting, and local opposition. The distinction is therefore not that one group has barriers and the other does not; it is that different institutional and infrastructural configurations produce different forms of investment risk.

4.3. Taxonomic contribution of the six-dimension framework

The six-dimension taxonomy is an incremental conceptual advance rather than a claim to replace earlier classifications. Its value lies in reorganizing established barrier concepts around the private-investment decision and making their cross-category pathways explicit. Table 7 shows how it relates to reference typologies.

Table 7. Positioning of the proposed taxonomy relative to reference frameworks

Reference framework	Primary emphasis	Treatment of barrier categories	Value added by the present review
Painuly (2001)	Diagnosis of renewable-energy penetration barriers and corresponding measures.	Forty-one barriers in seven categories, including separate market failure and market distortion categories.	Reorients the categories toward private-investment consequences; compares contexts and explicitly examines interactions.
Beck & Martinot (2004)	Policies that encourage or obstruct renewable-energy development.	Links barriers to pricing, subsidies, finance, information, skills, and institutional/policy design.	Separates market functioning from governance quality while showing how institutional choices connect them.
Painuly & Wohlgemuth (2006)	Renewable-energy financing experience in developing countries.	Concentrates on financial-sector development, finance availability, and investment risk.	Places finance within a wider configuration of institutional, market, technical, spatial, and social conditions.
Pereira et al. (2025)	Comparative SLR of energy-transition barriers in developed and developing countries.	Thirty-seven barriers in seven dimensions, with political/regulatory separate from governance/institutional.	Combines political/regulatory and institutional mechanisms for parsimonious synthesis and traces how six dimensions affect private investment.

Source: Authors

Three features provide the principal taxonomic value. First, the framework distinguishes governance and institutional quality from market functioning but retains an explicit pathway between them; this prevents a subsidy or pricing rule from being treated as a spontaneous market condition. Second, it gives geographical and ecological constraints analytical visibility. Terrain, remoteness, land availability, ecological sensitivity, and environmental assessment are distinct phenomena, but they can be aggregated at the synthesis level because they affect site feasibility, time, and project cost. Third, the taxonomy is relational: dimensions are not treated as sealed containers, and barriers are assigned by primary mechanism while their downstream effects are traced across dimensions. This makes the framework suitable for diagnosing why an apparently financial problem may require an institutional, market, infrastructure, or legitimacy intervention.

The taxonomy also has boundaries. Combining political/regulatory and governance/institutional factors improves parsimony but can conceal differences between formal rules, administrative capacity, and political commitment. Aggregating geography and ecology can similarly mask the distinction between physical constraints and socially constructed regulatory requirements. The framework should therefore be used hierarchically: detailed barrier codes remain distinct, while the six dimensions support comparison and synthesis. This qualification makes the contribution more defensible than presenting the categories as universally exhaustive or mutually independent.

4.4. Original contributions of the review

The review makes three original contributions. First, it shifts the unit of explanation from isolated barriers to barrier configurations and identifies governance, finance, and legitimacy as conditioning, transmission, and implementation mechanisms. Second, it combines study-level frequency evidence with a developed–developing comparison, showing that recurrence and causal importance are different questions and that similar labels can represent different mechanisms across contexts. Third, it translates the taxonomy into a diagnostic structure for private investment: policy design should begin with the pathway that makes a project unbankable or delayed, rather than with a generic list of remedies.

These contributions remain interpretive. The review does not estimate causal effect sizes, rank policy instruments econometrically, or establish that governance reform will always produce the largest investment response. Its contribution is to organize heterogeneous evidence into testable propositions. Future empirical research could examine, for example, whether regulatory credibility moderates the relationship between concessional finance and financial closure, or whether early participation reduces permitting time and financing premiums.

4.5. Context-specific policy implications

The policy implications follow from the interaction pathways identified in the review. They are therefore formulated as matched intervention packages rather than five independent recommendations. Table 8 links each package to the dominant context, the barrier mechanism it addresses, and an observable implementation focus.

Table 8. Policy packages derived from the reviewed barrier pathways

Policy package	Priority context	Barrier pathway addressed	Illustrative instruments	Implementation test
De-risk finance through credible institutions	Developing and institutionally fragile markets	Governance uncertainty → perceived risk → costly or unavailable finance	Transparent auction calendars; standardized PPAs; partial-risk guarantees; one-stop permitting; disclosure of approval timelines.	Finance should be conditional on credible rules and measurable reductions in approval and payment risk.
Build investable infrastructure pipelines	Developing countries, remote regions, and small island systems	Grid/storage/skills deficits → technical uncertainty and higher project cost	Grid investment plans; connection queues; storage procurement; project-preparation facilities; technical training and maintenance capacity.	Projects should have funded connection and capability plans before capital is mobilized.
Redesign mature markets for flexibility	Developed and higher-penetration power systems	Market design and grid congestion → revenue uncertainty and curtailment risk	Locational signals; flexibility and capacity markets; storage rules; curtailment compensation; faster grid-connection governance.	Reforms should improve revenue predictability without locking in technology-specific rents.
Coordinate permitting, land, and ecological review	Both groups; especially land-constrained or ecologically sensitive locations	Siting and fragmented approval → delay → cost escalation and opposition	Parallel rather than sequential reviews; spatial pre-screening; clear environmental timelines; community benefit arrangements; appeal procedures.	Faster decisions must preserve environmental integrity and procedural fairness.
Treat legitimacy as investment-risk management	Both groups; adapted to local concerns	Low trust or perceived unfairness → opposition → delay and policy instability	Early participation; transparent benefit sharing; locally accessible information; grievance mechanisms; distributional-impact assessment.	Engagement should influence project design, not operate only as one-way communication.

Source: Authors

The sequencing of these packages matters. In lower-capacity settings, expanding concessional finance before clarifying permits, payment security, and grid access may increase the number of announced projects without improving financial closure. In mature systems, adding generation incentives without resolving congestion, flexibility, and connection queues may increase curtailment and public cost. Across both settings, accelerated permitting that excludes communities or weakens ecological safeguards can transfer risk rather than remove it. Policy effectiveness should therefore be judged by whether the package resolves the binding configuration of barriers while avoiding new social or environmental constraints.

4.6. Publication bias and limits to interpretation

Publication bias may affect both the apparent prevalence and the framing of the identified barriers. Peer-reviewed journals are more likely to publish studies that report clear, substantial, or statistically significant problems than studies finding weak effects, successful mitigation, or no material barrier. Researchers may also select difficult or policy-salient cases because they offer a stronger analytical narrative. As a result, the corpus may overrepresent failure, conflict, and severe constraints while underrepresenting routine project delivery, unsuccessful hypotheses, and contexts in which barriers were effectively resolved.

This bias has three implications. First, the frequency table should not be interpreted as the population prevalence of each barrier. A dimension may appear often because it is easier to identify, more publishable, or more prominent in the disciplines represented in Scopus and Web of Science. Second, the interaction analysis may emphasize reinforcing negative pathways because successful coordination and barrier mitigation are less often framed as research problems. Third, the developed–developing comparison may be affected by unequal research capacity, journal access, and incentives to study crisis conditions in lower-income settings. The review’s conclusions therefore describe patterns in the published corpus, not the complete distribution of investment experiences.

The risk could not be quantified using conventional funnel plots or regression tests because the included studies are methodologically heterogeneous and do not report a common effect size. It was addressed only through cautious interpretation, explicit study-level tracing, and avoidance of causal or population-level claims. Future updates should search grey literature and specialist or regional databases, include project evaluations and evidence of successful barrier removal, and consider citation and outcome-sensitive analyses. Publication bias operates alongside the acknowledged English-language restriction, database coverage limits, absence of a formal study-level quality appraisal, and single-author screening and extraction.

4.7. Synthesis

Private renewable-energy investment is constrained not by a universal hierarchy of obstacles but by context-dependent configurations. Governance and institutional barriers are the most recurrent dimension in the reviewed corpus, yet their significance lies less in frequency alone than in their capacity to shape finance, markets, infrastructure delivery, and legitimacy. The six-dimension framework contributes by preserving these distinct mechanisms while making their interactions visible. Its practical implication is equally relational: policies should be combined and sequenced according to the pathway that creates risk, delay, or weak bankability in a particular setting.

5. Conclusion

This systematic literature review examined the barriers limiting private investment in renewable energy projects through a synthesis of 26 included publications. It addressed the three objectives established at the outset of the study. First, the review identified the principal constraints affecting private investment, including financing difficulties, regulatory uncertainty, market

distortions, infrastructure deficiencies, spatial and environmental constraints, limited technical capacity, and weak social acceptance. Second, it organized these barriers into six analytical dimensions: economic and financial, governance and institutional, market-related, geographical and ecological, technological, and sociocultural. Third, it compared the nature of these barriers across developed and developing countries. Although all six dimensions occur in both groups, their underlying mechanisms and practical consequences differ according to institutional capacity, financial-market development, infrastructure maturity, and the characteristics of national energy systems.

Governance and institutional barriers were the most frequently reported dimension, appearing in 14 of the 26 included publications (53.8%), followed by economic and financial barriers, which appeared in 12 publications (46.2%). These frequencies indicate recurrence within the reviewed literature rather than causal importance or effect magnitude. More importantly, the synthesis shows that barriers rarely operate independently. Regulatory instability and weak administrative coordination increase perceived risk and financing costs; market distortions reduce revenue predictability and project bankability; grid, storage, and technical-capacity limitations increase capital requirements and operational uncertainty; geographical and ecological constraints extend development timelines; and limited trust or stakeholder participation can generate opposition and weaken policy durability. Private renewable energy investment is therefore better understood as the outcome of interacting constraints than as a response to isolated obstacles.

The study makes both theoretical and empirical contributions. Theoretically, it consolidates established barrier concepts into a six-dimensional framework centred specifically on private investment. Its contribution lies not in presenting the six categories as entirely new, but in distinguishing their primary mechanisms while making the relationships among them explicit. In particular, the framework differentiates governance and institutional quality from market functioning, gives geographical and ecological conditions clearer analytical visibility, and explains how constraints originating in one dimension can generate financial or implementation consequences in another. It therefore offers a relational and context-sensitive taxonomy rather than a static list of independent barriers.

Empirically, the review provides a study-level synthesis of evidence from different geographical, institutional, and technological settings. The frequency analysis identifies the dimensions most recurrent in the selected corpus, while the developed–developing comparison shows that similar barrier labels can conceal different underlying problems. In developing countries, investment is more commonly constrained by limited affordable finance, weak institutions, policy instability, infrastructure gaps, insufficient technical capacity, and higher perceived risk. In developed countries, barriers are more often associated with complex permitting, fragmented regulatory responsibilities, electricity-market design, grid congestion, storage requirements, and local opposition. This distinction reinforces the need to interpret investment barriers within their national and institutional settings.

The policy implications consequently differ across contexts. In developing and institutionally fragile markets, financial support should be combined with measures that improve regulatory credibility and project bankability. Concessional finance, blended-finance structures, and public guarantees are unlikely to generate sustainable investment when power-purchase arrangements are uncertain, administrative procedures are unpredictable, or grid connection is not secured. Priority should therefore be given to transparent procurement schedules, standardized and enforceable contractual arrangements, coordinated permitting, payment-risk mitigation, grid-development plans, and technical-capacity building.

In developed and higher-penetration electricity systems, the central challenge is less the basic availability of capital than the coordination of mature but increasingly complex systems. Policy priorities should include faster and more predictable permitting, transparent grid-connection

procedures, transmission and storage investment, flexibility mechanisms, and electricity-market rules that reduce curtailment and revenue uncertainty. In both groups of countries, land-use and environmental approval should be coordinated without weakening ecological safeguards, while stakeholder participation should begin early enough to influence project design. Public engagement should therefore be treated as part of investment-risk management rather than as a communication exercise undertaken after major decisions have already been made.

These conclusions must nevertheless be interpreted in light of several limitations. Restricting the review to English-language publications may have excluded locally grounded research and underrepresented evidence from non-English-speaking countries. The use of Scopus and Web of Science may also have omitted relevant studies indexed only in specialist, regional, or open-access databases. In addition, article selection and data extraction were conducted by one author, meaning that inter-reviewer agreement could not be assessed. No formal study-level quality-appraisal instrument was applied, limiting the ability to distinguish methodologically stronger evidence from weaker contributions.

Publication bias presents a further limitation. Studies reporting substantial, statistically significant, or policy-relevant barriers may be more likely to appear in peer-reviewed literature than studies finding weak effects, successful mitigation, or no material constraint. The corpus may therefore overrepresent severe investment problems and reinforcing negative interactions while underrepresenting projects in which barriers were successfully addressed. The reported frequencies should consequently be understood as patterns in the available published evidence, not as estimates of the prevalence of barriers across all renewable energy investments.

Future research should move beyond identifying and counting barriers to test the relationships proposed in this review. Quantitative and mixed-methods studies could examine whether institutional credibility moderates the effectiveness of concessional finance, whether improved grid access reduces financing premiums, and whether early stakeholder participation shortens permitting timelines or lowers non-technical project risk. Comparative research should also distinguish between renewable energy technologies, project scales, electricity-market structures, and institutional settings. Future systematic reviews would benefit from broader database and language coverage, the inclusion of relevant grey literature, independent duplicate screening, and formal methodological-quality appraisal. Greater attention should also be given to successful projects and policy interventions to understand not only why barriers persist but how they can be removed.

Overall, mobilizing private investment in renewable energy requires more than expanding access to capital. It requires coordinated and context-specific policy packages that strengthen institutional credibility, improve market and contractual conditions, develop enabling infrastructure and technical capacity, and secure social legitimacy. By organizing the available evidence around these interdependencies and comparing how they operate across developed and developing contexts, this review provides a clearer basis for analysing the conditions under which private renewable energy investment can be accelerated.

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