



The Role of Government Policy in Responding to Climate Change: A Literature Review

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INFO ARTICLE

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Keywords:

adaptation governance;
climate action planning;
climate policy;
institutional capacity;
policy effectiveness.

ABSTRACT

Climate change generates increasingly complex governance challenges, requiring a comprehensive understanding of the effectiveness of policies, instruments, and institutional dynamics that shape countries' adaptive capacities. This study conducts a systematic review of research published between 2021 and 2025 to identify cross-contextual patterns regarding barriers and enablers of adaptation, policy approaches and instruments, policy effectiveness, and the political-institutional factors influencing climate policy outcomes. The search and selection process followed a rigorous SLR protocol, accompanied by thematic coding to map four major themes emerging from the reviewed articles. The synthesis indicates that adaptation barriers most frequently stem from governance fragmentation, regulatory ambiguity, limited institutional capacity, and the dominance of top-down approaches that overlook social vulnerability. Regarding policy instruments, Climate Action Plans, policy mixes, carbon taxes, Nature-Based Solutions, and adaptation finance mechanisms prove effective only when supported by robust institutional frameworks and cross-sectoral coordination. In many countries, integration between mitigation and adaptation within development policies remains weak, while technocratic approaches that prioritize infrastructure often create risks of the safe-development paradox and increase long-term exposure to climate hazards. Policy effectiveness is significantly shaped by socio-political dynamics such as partisanship, geopolitical interests, and the quality of public participation, which can either strengthen or weaken the legitimacy of climate policies. The synthesis underscores that successful climate governance requires stable legal and institutional frameworks, the integration of adaptation and mitigation, participatory and equity-oriented approaches, reliable technical instruments and data, as well as coordinated and sustained implementation. This study advances the understanding of how structural, social, and political factors shape climate adaptation effectiveness and provides a conceptual foundation for developing more inclusive, integrated, and responsive climate policies in the face of escalating climate risks.



1. INTRODUCTION

Climate change represents one of the greatest global challenges of the 21st century, affecting not only the environment but also social, economic, and political dimensions. Arias et al., (2021) emphasize that rising global average temperatures, shifting precipitation patterns, and increasing frequencies of hydrometeorological disasters have intensified vulnerabilities across communities worldwide. These phenomena demand coordinated and multi-layered policy responses from national governments, subnational authorities, and local communities to ensure the resilience of socio-ecological systems against climate-related shocks. In this context, the role of government policy becomes crucial, as it defines the strategic direction of both mitigation and adaptation efforts.

Government policies addressing climate change have become central to numerous studies due to the government's strategic position as regulator, facilitator, and implementer of climate programs. Governments hold the authority to formulate regulations, allocate resources, and create incentives for both public and private sectors to contribute to emission reduction and climate adaptation. However, the effectiveness of these policies is often constrained by political dynamics, fiscal limitations, and coordination challenges across levels of government. Understanding how government policies are designed and implemented is therefore essential for assessing a country's preparedness in confronting the impacts of climate change.

Climate governance has evolved into a complex polycentric structure encompassing global, national, and subnational levels, relying on networks and channels of both formal and informal policymaking (Bulkeley et al., 2014; Jordan et al., 2015). Within and across countries, state and non-state actors at multiple scales engage in the formulation and implementation of climate policies and actions (Newell, 2000). This complex governance architecture reflects the "glocal" nature of climate change: its impacts are experienced differently across scales, while its solutions require action at multiple levels of governance (Gupta, 2007).

Climate change poses both acute and chronic challenges to effective governance, requiring responses to sudden events (pulse events) such as Cyclone Nargis, which killed more than 130,000 people in Myanmar in 2008, as well as gradual (press) events such as sea level rise (Collins et al., 2011). Adaptation activities vary widely, ranging from community-led initiatives to large-scale, government-driven projects. In managing flood risks, for example, peri-urban communities often depend on homeowners' associations to maintain green infrastructure, although limited financial and technical capacity often undermines these efforts (Allen, 2006).

Under such conditions, municipal and provincial governments ultimately bear primary responsibility for financing adaptation measures, including major investments in public infrastructure that are threatened by climate impacts. These investments include coastal roads that are increasingly vulnerable to sea level rise (Moser et al., 2012; Ruppert & Deady, 2017). Governance challenges become more complex as cities must operate within long-term planning horizons, account for local stakeholder participation, and simultaneously confront fiscal constraints. Extreme events often trigger rapid resource redistribution for emergency response, while slow-onset climate trends tend to receive less political attention even though their long-term consequences are significant.

Although research on climate governance and policy has grown rapidly, much of the literature remains focused on specific countries or sectors, such as energy systems, major cities, or market mechanisms. These studies often do not systematically integrate the relationships between institutional barriers, policy instruments, implementation effectiveness, and political dynamics across contexts. Existing reviews also tend to adopt narrow thematic or regional scopes, which limits understanding of how governments respond to climate change across governance levels in the period following the strengthening of the Paris Agreement agenda. Therefore, this study aims to address this gap through a systematic literature review of empirical articles published between 2021 and 2025. The review examines the types of policies implemented, the extent to which these policies are effective, and the ways in which institutional and political factors shape the success or failure of governmental responses to climate change.



2. RESEARCH METHODOLOGY

2.1. PRISMA Statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)

One of the essential components of a systematic review is the literature search. The process of literature searching, or information retrieval, not only determines the final outcome of the review but also provides the foundational data for analysis. Other stages in a systematic review, such as screening, data extraction, and both qualitative and quantitative synthesis, depend heavily on the accurate identification of eligible studies. Therefore, the literature search must be designed rigorously and be replicable in order to minimize potential bias (Rethlefsen et al., 2021). This systematic literature review was conducted with reference to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure clarity, transparency, and reproducibility throughout the review process. The PRISMA flow diagram was used to document the stages of identification, screening, eligibility assessment, and inclusion of articles.

2.2. Formulation of the Research Question

The formulation of the research questions was carried out using the PICO framework. This framework assists researchers in developing research questions that are suitable for literature-based studies by considering three main elements, namely Population or Problem, Interest, and Context (Abas et al., 2022). In this study, the Population or Problem refers to climate change as a global issue, the Interest refers to government policies in responding to climate change, and the Context refers to the global setting that encompasses both mitigation and adaptation efforts. Based on this framework, the study is guided by three primary research questions: (1) what government policies have been implemented globally in response to climate change; (2) to what extent these policies are effective in addressing mitigation and adaptation challenges; and (3) what gaps, challenges, and opportunities exist in the formulation and implementation of climate policies more broadly.

2.3. Systematic Searching Strategies

As shown in Figure 1, the systematic search process involves three primary steps: identification, screening, and eligibility.

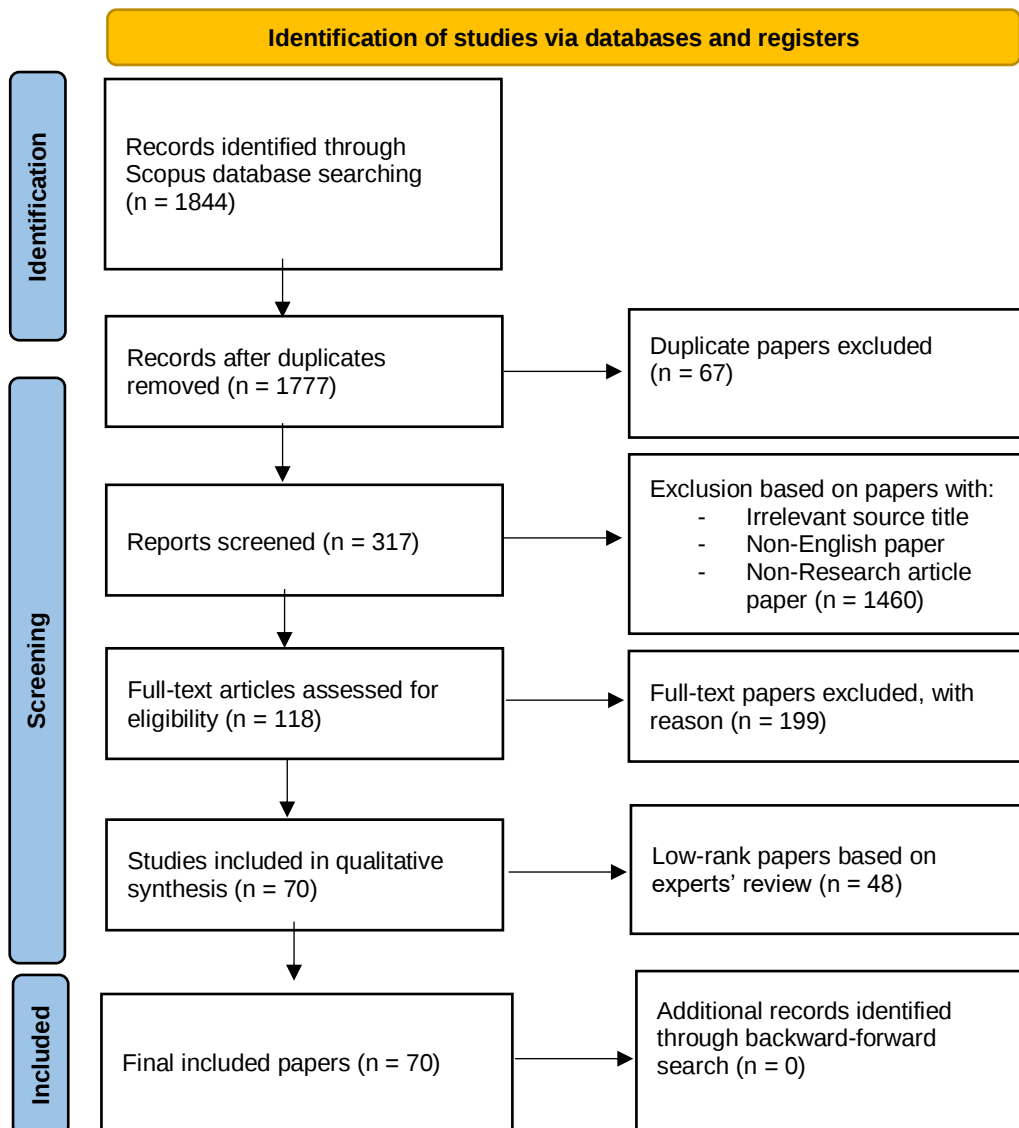


Figure 1. A flow diagram of the process.

a. Identification

The initial stage involved identifying the main keywords, followed by exploring related terms that are relevant to the research topic. In this case, the search was focused on climate change in relation to government policies within the contexts of mitigation, adaptation, and broader policy responses. To assess the effectiveness of these policies, additional keywords related to impact, outcomes, evaluation, and assessment were included. Furthermore, aspects concerning policy challenges and opportunities were accommodated through terms such



as challenge, barrier, gap, and opportunity. As shown in Table 1, these keywords were then combined into search strings using Boolean operators in the Scopus database.

Table 1. The search strings.

Database	Search Strings
Scopus	(TITLE-ABS-KEY ("climate change" OR "global warming")) AND (TITLE-ABS-KEY ("government policy" OR "public policy" OR "climate policy" OR "environmental policy")) AND (TITLE-ABS-KEY (mitigation OR adaptation OR response OR action)) AND (TITLE-ABS-KEY (effectiveness OR impact OR outcome OR evaluation OR assessment)) AND (TITLE-ABS-KEY (challenge* OR barrier* OR gap* OR opportunit*))

In this study, the literature search was conducted using the Scopus database as the primary source. Scopus was selected because it provides broad coverage of international journals, ensures publication quality through a rigorous selection process, and offers comprehensive search features suitable for multidisciplinary academic literature, including studies on climate change policy. In addition, Scopus is widely recognized as one of the largest and most credible bibliographic databases, making it appropriate for supporting the quality and relevance of this literature review. The labels in the PRISMA diagram that refer to other databases are illustrative and follow the standard template, whereas the actual search process was focused exclusively on Scopus.

b. Screening

A total of 1,844 articles were initially identified, and 67 duplicate records were removed, leaving 1,777 articles for further screening. These articles were then re-evaluated, with only those meeting the inclusion criteria retained. The criteria required that the articles contain empirical data, be published in academic journals, be written in English, fall within the publication period of 2021 to 2025, and be relevant to the research topic. Other types of publications, such as reports, books, or reviews, were excluded. This time frame was selected because the period from 2021 to 2025 represents an important phase in the development of climate policy, marked by the implementation of Paris Agreement commitments, the strengthening of Net Zero Emissions agendas, and the emergence of various adaptation and mitigation policies at both global and national levels. The selection process resulted in the exclusion of 1,460 articles that did not meet the inclusion criteria, leaving 317 articles for subsequent stages.

c. Eligibility

The third step, which constituted the eligibility stage, was carried out by directly reviewing the articles obtained to ensure that, following the screening process, each article fully met the predetermined criteria. This process involved reading the titles and abstracts of the articles. A total of 199 articles were excluded for several reasons, including lack of relevance to the topic of government policy responses to climate change, absence of empirical data, unclear methodology, or publication in formats other than journal articles, such as conference proceedings, books, and reports. As a result, only 118 articles remained and were accepted for the subsequent stage.



2.4. Quality Appraisal

Quality assessment was conducted to ensure that the articles included in the analysis met adequate scientific standards and to minimize potential bias. Articles that passed the eligibility stage were re-examined to evaluate their technical rigor and methodological consistency. Each article was then categorized into three levels of quality, namely high, medium, and low, based on a qualitative assessment of three main parameters: (1) clarity of the research objectives, (2) methodological rigor, including transparency in data collection and analysis procedures, and (3) direct relevance to the review's focus on the role of government policies in responding to climate change. The assessment process was carried out systematically by referring to principles of critical appraisal in policy and governance studies, although no single standardized checklist was used. Only articles classified as high and medium quality were selected for further review. Of the 118 remaining articles, 48 were categorized as low quality and excluded, leaving 70 articles that met the quality standards and proceeded to the data extraction and thematic analysis stage.

2.5. Data Abstraction and Analysis

In this study, thematic analysis was used to identify and categorize the extracted data into themes and subthemes. As described by Braun and Clarke (2006), thematic analysis involves identifying patterns, grouping similar data, calculating frequencies, and noting relationships that emerge within the abstracted data. All data that were similar or conceptually related were grouped into the same category. Following a comprehensive analysis, four main themes were identified, namely: (a) Political and Institutional Drivers, (b) Policy Instruments and Approaches, (c) Policy Outcomes and Effectiveness, and (d) Barriers and Enablers.

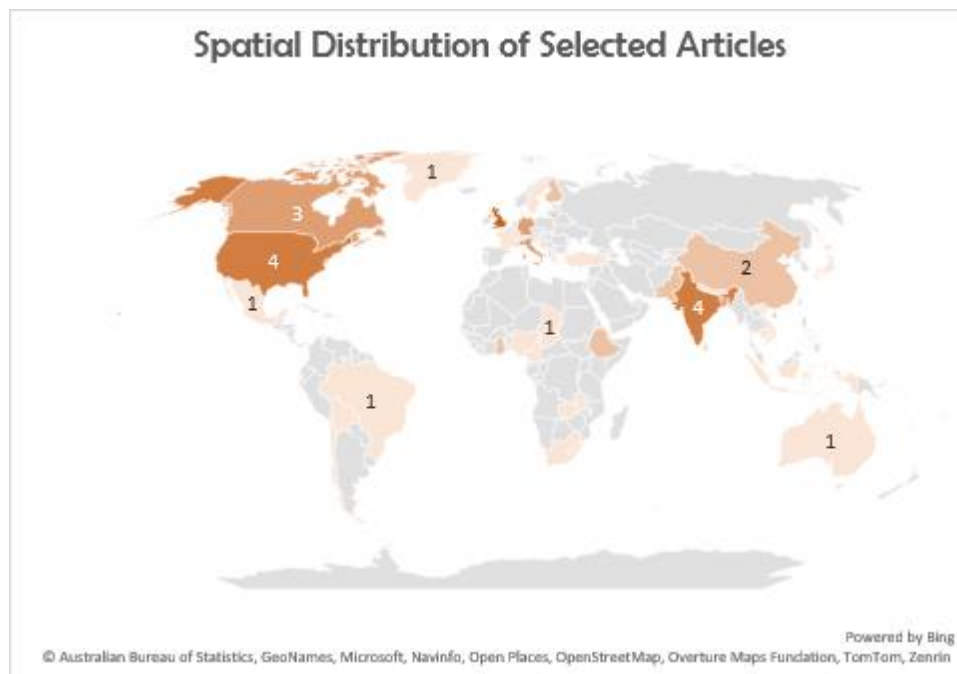
3. RESULT

3.1 Spatial and Temporal Analysis of Selected Articles

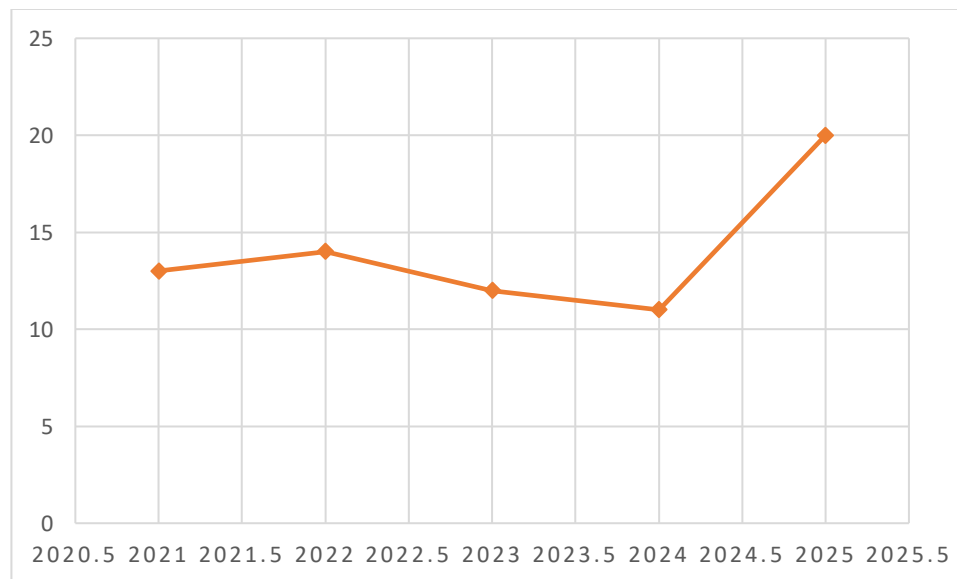
As shown in Figure 2a, the spatial distribution of the analyzed articles indicates that research on the role of government policy in responding to climate change is concentrated in a limited number of countries. The highest number of publications originates from the United Kingdom (5 articles), followed by the United States (4 articles) and India (4 articles). Other notable contributors include Canada, Germany, Italy, and Bangladesh, each with 3 articles, while most countries such as Australia, Brazil, Indonesia, Nepal, Vietnam, and Zambia contributed only one article.

In addition to single-country studies, several articles examine regional or cross-country contexts, including the European Union (2 articles), the Mediterranean region (1 article), and clusters of countries such as France, Germany, Italy, Ireland, and Poland. These cross-country or regional studies are not visualized in the map but are described narratively to highlight that climate policy is also examined within the context of international collaboration. Overall, this distribution reflects a higher concentration of research in developed countries, particularly Western Europe, North America, and South Asia, compared to Africa and most of Southeast Asia.

The distribution of articles by year is presented in Figure 2b. The data show an increasing trend throughout the 2021 to 2025 period. In 2021, there were 13 articles, which increased to 14 articles in 2022, followed by a slight decline to 12 articles in 2023. The number of publications decreased again to 11 articles in 2024, but rose sharply in 2025 with 20 articles. This surge in 2025 illustrates growing academic attention to government policies addressing climate change, in line with the increasing urgency of this issue within both national and global agendas.



(a)



(b)

Figure 2. (a) The spatial distribution of selected articles. (b) The temporal distribution of selected articles.

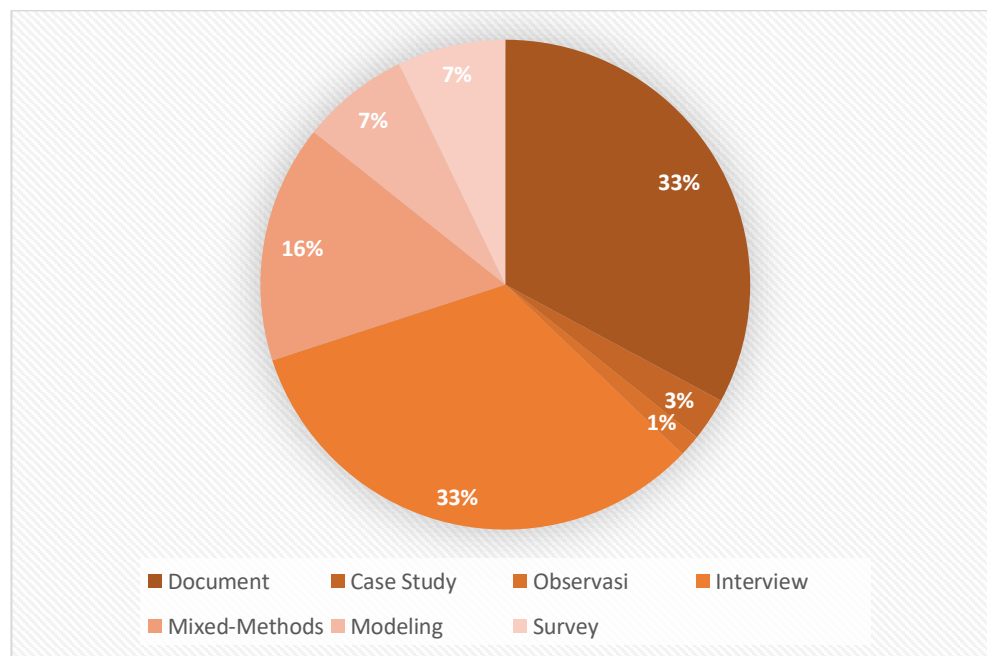
3.2 The Role of Government Policy in Responding to Climate Change – Contextual Issues

The distribution of research methods used in the selected articles is presented in Figure 3a. The analysis shows that the most dominant methods are document analysis and interviews, each used in 23 articles (33 percent). Other prominent methods include mixed methods with 11 articles (16 percent), followed by modeling or simulation and surveys, each found in 5 articles (7 percent). Meanwhile, case studies appear in only 2 articles (3 percent), and observation is used in just 1 article (1 percent). These findings indicate that research on climate

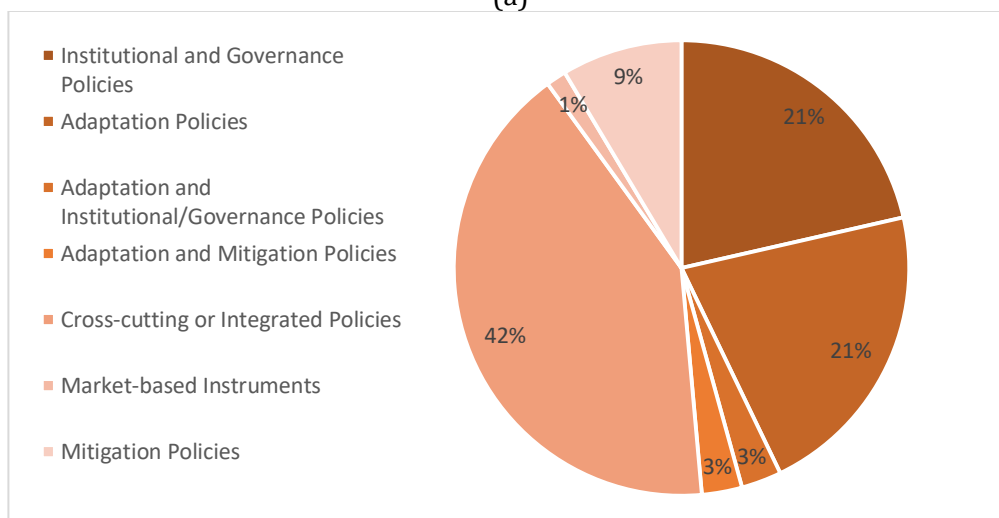


policy tends to rely more heavily on secondary data and stakeholder interviews, while the use of field experiments or observational methods remains relatively limited.

The types of policies discussed in the selected articles are displayed in Figure 3b. Cross-sector or integrated policies represent the most dominant category, appearing in 29 articles (42 percent), which suggests that many studies emphasize comprehensive policy approaches. Institutional and governance policies and adaptation policies each appear in 15 articles (21 percent). Mitigation policies are discussed in 6 articles (9 percent), while other categories are relatively limited, including adaptation and governance (2 articles, 3 percent), adaptation and mitigation (2 articles, 3 percent), and market-based instruments (1 article, 1 percent). These findings demonstrate that the literature focuses more extensively on integrative and adaptation-oriented policies compared to market instruments or purely mitigation-focused policies.



(a)



(b)

Figure 3. (a) Method used in selected articles. (b) Policy types.



3.3 The Role of Government Policy in Responding to Climate Change – Thematic Analysis

There are four overall themes in The Role of Government Policy in Responding to Climate Change, namely Barriers and Enablers, Policy Instruments and Approaches, Policy Outcomes and Effectiveness, and Political and Institutional Drivers. The analysis shown in Figure 4 indicates that the most frequently studied theme is Barriers and Enablers, which appears in 25 studies (38 percent), followed by Political and Institutional Drivers with 18 studies (27 percent), Policy Instruments and Approaches with 16 studies (24 percent), and Policy Outcomes and Effectiveness with 13 studies (20 percent). One study addresses three themes simultaneously, specifically Barriers and Enablers, Policy Instruments and Approaches, and Political and Institutional Drivers, and is therefore counted within each relevant category. As a result, the overall percentages exceed 100 percent due to overlaps across themes.

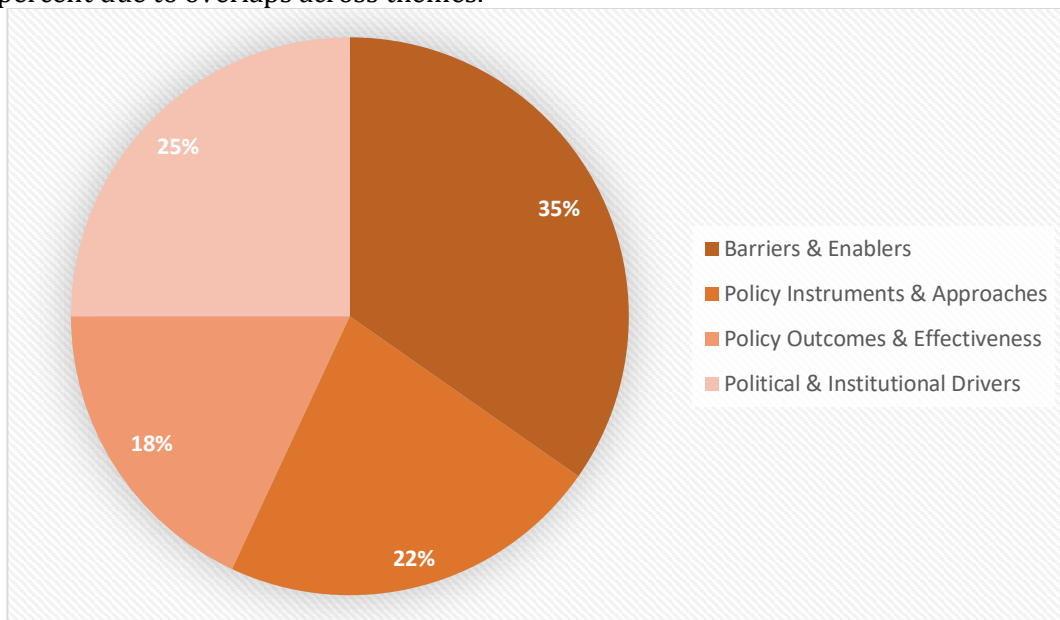


Figure 4. The role of government policy in responding to climate change.

3.3.1 Barriers and Enablers

The analysis of all studies within the Barriers and Enablers theme shows that obstacles and facilitating factors for climate change adaptation emerge across four main dimensions: institutional capacity, resources and funding, stakeholder engagement, and socio-ecological and political contexts. These patterns are consistent across various geographical settings, ranging from cities in North America and Europe to vulnerable regions in Africa and Asia.

a. Weak Institutional Capacity and Fragmented Governance

Most articles highlight weak institutional capacity as the primary barrier to climate adaptation. In Ghana, the implementation of Climate Change Adaptation Programs remains far from effective due to limited funding, inadequate staff capacity, and the absence of proper monitoring systems (Fatimatu & Gabriel, 2021). A study in Surrey, Canada, reveals a gap between planning and implementation, where formal and informal institutional barriers play a more decisive role than data limitations or technical resources (Birchall & Bonnett, 2021). In Japan, many local governments only fulfill procedural requirements without translating policies into substantive local actions (Iseki, 2024a).

In the contexts of Pakistan and Bangladesh, governance challenges appear even more acute. Climate policies are highly top down, leading to misinterpretation, mistrust, and limited participation from vulnerable groups (Masud & Khan, 2024; M. M. Rahman, 2023). Corruption, illegal land grabbing, and weak accountability further undermine the effectiveness of adaptation programs. In the Visegrád



countries, although climate strategies align with the European Union, implementation is hindered by the dominance of national economic interests and energy security concerns (Kovács et al., 2024).

Conversely, several studies show that when institutional capacity is strong and key actors are committed, climate innovation is more likely to succeed. In small cities in Germany, the combination of external support and internal capacity enables the adoption of adaptation innovations, particularly when active policy entrepreneurs help maintain climate issues as policy priorities (Corcaci & Kemmerzell, 2022). In the United Kingdom, the proposed narrative of a Climate Resilient Net Zero framework emphasizes the need for institutional structures and organizational cultures that support the integration of mitigation and adaptation (Howarth et al., 2025).

b. Resource Scarcity, Financial Limitations, and Data Gaps

Limitations in financial, human, and knowledge resources constitute recurring barriers. Local governments in Ashanti, N'Djamena, and various cities in Japan and Pakistan face shortages of funding, personnel, and supporting infrastructure, resulting in many adaptation programs not being fully implemented (Allaran et al., 2024; Fatimatu & Gabriel, 2021; Iseki, 2024b; Masud & Khan, 2024). In Copenhagen, funding for the Cloudburst project is considered innovative, yet it is sourced almost entirely from public funds, while private sector involvement remains very low due to high perceived risks, small project size, and the limited availability of bankable projects (Whittaker & Jespersen, 2022). Financing challenges are also evident in the adoption of blue nature-based solutions in the European Union, which is constrained by the absence of strong policy support and clear funding mechanisms (Lise et al., 2025).

At the knowledge level, several studies highlight significant data gaps. The quality, availability, and interoperability of data are considered inadequate for supporting evidence-based adaptation planning, particularly in developing countries (Andries et al., 2023). The lack of standardized data and clear indicators complicates the integration of climate policy with sustainable development agendas, as seen in the relationship between NDCs and the SDGs in Pacific Island countries (Prasad & Raturi, 2025).

c. Limited and Unequal Stakeholder Participation

Stakeholder participation emerges as a determining factor, yet it is often limited, unequal, or merely procedural. In New York, community-based organizations demonstrate a high level of awareness regarding adaptation planning, but actual participation remains low, particularly among smaller CBOs with limited resources (Rudge, 2021). Other studies show that decision-support tools such as CRAFT have limited direct influence on policy, but they function as important platforms for building relationships, communication, and trust between researchers and policymakers (Deloly et al., 2021).

In Bologna, formal participatory practices do not automatically lead to procedural justice. Neighborhood Houses serve as important spaces for re-politicizing climate discourse and enabling community organizing, yet the role of community-based organizations remains marginal due to the dominance of public-private alliances and unequal power configurations (Fontana et al., 2025). Similar conditions are found in Pakistan and Bangladesh, where grassroots groups, women, and local communities are rarely meaningfully involved in the formulation and implementation of policies (Masud & Khan, 2024; M. M. Rahman, 2023).

Conversely, intensive participation grounded in local experience can serve as a strong enabler. A study in Yorkton shows that three consecutive flood events triggered social learning that strengthened communication between the municipal government and residents, enhanced technical capacity and risk awareness, and encouraged revisions to emergency planning (Salman & Hurlbert, 2022).

d. Sociocultural, Biophysical, and Demographic Contexts

Social, cultural, and biophysical contexts play a significant role in shaping adaptive capacity. In KwaZulu-Natal, poor urban women experience disproportionate impacts of climate change due to traditional gender roles, limited assets, and political marginalization, while their responses continue to rely on traditional practices and beliefs in supernatural factors (Hlahla et al., 2022). Studies in Brazil



and Ghana highlight how Indigenous communities and smallholder farmers face dual vulnerabilities resulting from prolonged drought, land loss, and the lack of recognition of local knowledge in agricultural and rural development policies (Mendes et al., 2023; Yeleliere et al., 2023).

In demographic contexts, depopulation and an aging population in Croatia reduce the labor force in vital sectors such as tourism, construction, and agriculture, thereby weakening national climate resilience (Boromisa, 2025). At the individual level, climate anxiety, or anticipatory trauma reaction, can serve as a driver of pro-environmental behavior if mediated by self-efficacy and reinforced by supportive social norms (Yadav et al., 2023). However, a study in Germany shows that high climate awareness does not necessarily translate into substantial changes in consumption patterns in mobility, food, and housing sectors, even though it contributes significantly to strengthening climate policy agendas (Venghaus et al., 2022).

In the agricultural sector, farmers in the Wabash River Basin adopt cover crops primarily to reduce soil erosion rather than in response to climate change, and these decisions are strongly influenced by agronomic experience and social pressures within farming communities (Yoder et al., 2021).

e. Ethical Issues, Justice, and Policy Coherence

Several studies emphasize the ethical and justice dimensions of adaptation. Planners in southern Sweden face ethical dilemmas related to the distribution of legal and moral responsibility, intergenerational justice, and distributive justice when balancing physical protection, economic value, and cultural heritage (Wedin, 2021). In Bologna, merely symbolic participation generates risks of tokenism and threatens the legitimacy of climate policies, particularly for vulnerable groups (Fontana et al., 2025). Studies in the Pacific and the European Union also highlight the importance of coherence between NDCs, the SDGs, and other development agendas, as well as the integration of nature-based solutions throughout the entire policy cycle to avoid cross-sectoral trade-offs (Lise et al., 2025; Prasad & Raturi, 2025).

Overall, the Barriers and Enablers theme shows that adaptation challenges do not stand alone but instead reinforce one another. Funding and data shortages weaken institutional capacity, while fragmented governance amplifies social exclusion and inequities. At the same time, socio-cultural and demographic contexts deepen disparities in adaptive capacity across groups and regions. However, cross-study findings also reveal several enablers that consistently emerge, such as adaptive institutional capacity supported by policy entrepreneurs, clear regulatory frameworks, cross-sectoral coordination, and adequate and innovative financing mechanisms, including private sector engagement when risks and benefits are managed appropriately.

Moreover, meaningful participation from local communities, community-based organizations, and vulnerable groups is essential, alongside the integration of scientific knowledge with local knowledge and the establishment of reliable and standardized data systems. Political commitment and policy coherence that links adaptation, mitigation, and sustainable development goals also play a critical role in strengthening resilience. Overall, these findings underscore that successful climate change adaptation cannot be achieved solely through policies formulated on paper, but requires a combination of structural, social, and technical interventions that operate in a complementary manner.

3.3.2 Policy Instruments and Approaches

The analysis of the Policy Instruments and Approaches theme shows that climate policy efforts across countries are shaped by the quality of policy instruments, governance capacity, participatory approaches, social justice considerations, and the integration of mitigation and adaptation. Cross-study findings reveal five major patterns: imbalances between mitigation and adaptation, insufficient legal and institutional frameworks, implementation gaps, participatory approaches and justice, and the role of data and technical instruments in strengthening policy effectiveness.



a. Imbalance Between Mitigation and Adaptation in Policy Design

Several studies highlight that climate policies tend to place greater emphasis on mitigation than on adaptation. In metropolitan cities in India, Climate Action Plans remain dominated by mitigation agendas despite increasing adaptation pressures, and the quality of CAPs varies depending on governance factors, funding availability, and global network engagement (Khalid & Okitasari, 2023). Similarly, in Turkey, Local Climate Change Action Plans include adaptation components but continue to prioritize specific sectors such as water and disaster risk, while support for vulnerable groups remains limited (Tuğaç, 2025).

In several major countries, mitigation frameworks also face challenges related to policy fragmentation. A comparative study of South Africa, China, the United States, and Germany shows the need to align emission reduction targets with supporting strategies, broaden coverage of carbon-intensive sectors, and strengthen regulatory mechanisms such as carbon pricing (Abraham-dukuma et al., 2021). A similar situation is observed in Canada, where incentive-based policies dominate the climate policy landscape, yet their effectiveness has not been adequately measured (Scott et al., 2025).

b. Inadequate Legal and Institutional Frameworks

Gaps in legal and institutional frameworks constitute a consistent pattern across the studies. Research on the carbon tax in Cameroon shows that although the instrument is theoretically effective, it cannot be implemented due to the absence of specific legal frameworks, limited supporting legislation, and the low priority of the carbon tax within the national NDC (Ngwome, 2023). A study in Thessaloniki further emphasizes that spatial planning requires an integrated framework and stronger regulations to effectively protect land and address coastal risks, particularly in metropolitan areas (Thoidou, 2021).

At a broader policy level, cross-sectoral incoherence is evident in studies of the United Kingdom and Bangladesh. The United Kingdom possesses strong legal foundations, such as the Climate Change Act 2008, whereas Bangladesh continues to face gaps in legal frameworks, institutional capacity, and independent monitoring mechanisms (M. A. Rahman et al., 2025). Within the European Union, unclear regulatory standards and jurisdictional differences hinder the uniform implementation of low-carbon material initiatives (Assaad, 2024).

c. Implementation Gaps and Capacity Challenges

Most articles highlight a significant gap between policy formulation and implementation on the ground. A participatory study in Baja California Sur shows that policies addressing floods and droughts remain weak due to inadequate risk data, limited infrastructure, and ineffective coordination between government and community actors (Imaz-Lamadrid et al., 2023). A planetary health study in Australia similarly demonstrates a disconnect between citizens' preferences and the actual capacity of local governments to translate adaptation needs into action (Robson et al., 2022).

Implementation gaps also appear in policy evaluation practices in the United Kingdom, where assessment frameworks such as cost-benefit analysis are considered biased toward maintaining the status quo and insufficient for capturing transformative change. As a result, new methodologies such as Risk Opportunity Analysis have been proposed (Lynch et al., 2025). In India, the implementation of CAPs is hindered by unstable funding, unclear role distribution, and the absence of standardized indicators of success (Khalid & Okitasari, 2023).

d. Participatory Approaches, Equity, and Justice in Policy Instruments

Many articles emphasize the importance of participation and justice in the design of climate policies. A study in Bologna shows that although the city has a long history of direct participation, the integration of justice into policy processes continues to face value conflicts, the dominance of public-private alliances, and risks of tokenism toward community organizations (Fontana et al., 2025). Similar findings appear in Finland and the European Union, where justice dimensions such as procedural, recognitive, and distributive justice are not always evenly integrated into environmental, health, and climate policies (Tikkakoski et al., 2024).



Beyond justice, participation has been shown to improve policy quality. The Prospective Rapid Impact Assessment method in Lithuania is effective in identifying priority issues, engaging cross-sector stakeholders, and mapping interdependencies among actions in order to strengthen regional climate action planning (Lukmine et al., 2025). In Barcelona, community-based approaches enable a more transformative integration of climate justice compared to Berlin, which remains predominantly technocratic (Berner et al., 2025).

e. Role of Technical Instruments, Data, and Scientific Evidence

Several studies show that scientific evidence and technical instruments play an important role in shaping climate policy. A time-series analysis of surface temperature in the Kumaun Himalaya reveals significant warming trends that require immediate policy responses in both adaptation and mitigation (Khan et al., 2025). Other studies demonstrate that public procurement can serve as an effective tool for promoting the use of low-carbon materials when technical instruments such as EPDs and GWP assessments are well standardized (Assaad, 2024).

At the institutional level, the success of policies depends heavily on the reliability of data. For example, a planetary health study finds that integrating Indigenous knowledge, supported by community engagement, can strengthen local policies when accompanied by verification mechanisms and sustained dialogue (Robson et al., 2022). A comparison of climate resilience between the United Kingdom and Bangladesh further underscores the importance of high-quality data, policy literacy, and strong evaluation capacity to ensure effective policy implementation (M. A. Rahman et al., 2025).

The synthesis of all reviewed articles shows that effective climate policy requires a strong combination of structural, social, and technical foundations. Success depends heavily on clear legal and institutional frameworks, with consistent regulations, non-overlapping authorities, and well-structured monitoring and evaluation mechanisms. In addition, achieving a balance between mitigation and adaptation is essential, particularly in the context of Climate Action Plans and urban policies that require cross-sectoral integration. Participatory and justice-oriented approaches also constitute critical prerequisites, not only to ensure the inclusion of vulnerable communities but also to guarantee equitable distribution of adaptation benefits and burdens. Policy effectiveness is further shaped by the availability of reliable technical instruments and data, including risk assessments, indicators of success, and policy evaluation tools that can be applied consistently over time. Ultimately, coordinated implementation supported by adequate funding, clear role distribution, and strong institutional capacity serves as a key determinant in addressing the complexity of climate risks. These findings underscore that the success of climate policy is shaped not only by policy design but also by the synergy between structural, social, and technical dimensions, as well as the integration of justice and participation principles throughout both policy formulation and implementation processes.

3.3.3 Policy Outcomes and Effectiveness

Overall, studies within the Policy Outcomes and Effectiveness theme show that the performance of climate policies is shaped by the types of instruments used, the quality of governance, cross-sectoral integration, and the design of participation and justice. Findings across countries and policy scales cluster into five main patterns: the effectiveness of ecosystem-based approaches and policy mixes, the quality of governance and institutional design, financing mechanisms, the integration of adaptation and mitigation within development planning, and the role of citizen participation alongside knowledge- and technology-based instruments.

a. Effectiveness of Ecosystem Based Approaches and Policy Mixes

Several studies highlight the strong potential of ecosystem-based approaches and combinations of policy instruments. In Nepal, ecosystem-based adaptation interventions have been shown to reduce climate vulnerability, strengthen socio-ecological resilience, and diversify livelihoods through non-timber forest products, ecotourism, and agriculture, while also being relatively cost-effective and efficient in enhancing adaptive capacity (Bhattarai et al., 2021). However, limited policy support,



unclear conceptual frameworks, and weak institutional arrangements constrain the scale and long-term sustainability of these programs.

In the Mediterranean region, the application of nature-based solutions within the water–ecosystem–food nexus improves soil fertility, biodiversity, water efficiency, and agricultural productivity, although economic barriers, low awareness, and insufficient policy support continue to hinder broader adoption (Vanino et al., 2024). In the context of marginal lands in Liguria, a combination of mandatory and voluntary instruments within policy mixes, such as agri–environmental schemes, eco-schemes, and results-based payments, has proven effective in reducing soil erosion and preventing land abandonment, particularly when supported by careful monitoring and well-designed incentives (Vergamini et al., 2024).

In Pakistan, policy scenarios that integrate air pollution control and climate mitigation yield substantial co-benefits. The Sustainable Development Scenario significantly reduces PM_{2.5} concentrations by nearly half, prevents premature deaths, lowers greenhouse gas emissions, and decreases pollution control costs, thereby supporting both NDC targets and several SDGs simultaneously (Anwar et al., 2022). These findings underscore that integrated ecosystem-based approaches and policy mixes can produce greater environmental and socio-economic outcomes than single-instrument strategies.

b. Governance Quality and Multi Level Institutional Design

Governance quality emerges as a key determinant of policy effectiveness. A study in Addis Ababa shows that although the city has developed climate change plans and strategies, its governance effectiveness scores remain relatively low due to weak accountability, limited participation, inadequate law enforcement, insufficient institutional capacity, and minimal involvement of non-state actors (Addis et al., 2022). In Hong Kong, three forms of collaboration within urban climate governance are assessed as insufficient to drive low-carbon transformation, largely due to power imbalances, the dominance of government and utility companies, and conservative policy orientations (Cheung & Fuller, 2022).

Conversely, several governance configurations demonstrate positive outcomes. In China, synergistic governance for reducing air pollutants and CO₂ improved from a state of mild non-synergy to moderate synergy between 2011 and 2020, particularly after a major policy turning point in 2017, although regional disparities persist (Yi et al., 2023). In the United States, certain elements of polycentric governance such as cross-jurisdictional cooperation and overlapping decision-making centers are associated with reductions in subnational greenhouse gas emissions, especially in the energy sector, even though not all aspects of polycentric governance show significant effects (Daley et al., 2024).

c. Financing Mechanisms and Climate Funds

From a financing perspective, innovative funding mechanisms demonstrate a mix of strengths and limitations. The Indonesia Climate Change Trust Fund is considered effective in aligning adaptation projects with national plans and the SDGs, while also emphasizing inclusion through the involvement of NGOs, farmers, and fishers (Sheriffdeen et al., 2022). However, the absence of strong legal and institutional frameworks, dependence on national budgets and bilateral donors, and difficulties in accessing large multilateral funds limit the scale and long-term sustainability of the ICCTF, particularly in urban areas.

Other studies indicate that without robust and long-term financing frameworks, efforts to integrate adaptation and mitigation often remain project-oriented and unsustainable, as observed in several policy documents in Ethiopia (Hirpha & Mpandeli, 2025). These findings reinforce the argument that the effectiveness of climate policy outcomes is highly dependent on the stability and design of funding mechanisms.

d. Integration of Adaptation and Mitigation into National and Local Planning

Several studies highlight weak integration between adaptation and mitigation within development planning and cross-sectoral policies. In Ethiopia, environmental and development policies



refer to climate change only in general terms without clear adaptation strategies, while documents such as the EPACC and NAPA tend to be short term and sector specific, characterized by weak institutional coordination and a high dependence on external funding (Hirpha & Mpandeli, 2025). In Vietnam, climate adaptation policies also face challenges related to data coordination, transparency, accountability, and weak anti-corruption mechanisms, as well as failures to adequately target vulnerable groups and incorporate local knowledge and gender perspectives (Quang, 2025).

In contrast, studies in Nepal and the Mediterranean region show that when ecosystem-based approaches are integrated into government planning and supported by clear decision-making frameworks, policies become more effective in enhancing adaptive capacity and long-term resilience, although they still require stronger institutions and consistent policy support (Bhattarai et al., 2021; Vanino et al., 2024).

e. Participation, Perceptions, and Knowledge Based Instruments

The dimensions of citizen participation and public perceptions also influence the effectiveness of policy outcomes. In Vietnam and Ethiopia, the lack of explicit attention to vulnerable groups, local knowledge, and procedural justice increases the risk of maladaptation and reduces the legitimacy of policies (Hirpha & Mpandeli, 2025; Quang, 2025). Experimental studies on climate change assemblies show that general information about citizens' assemblies has only limited impact on correcting misperceptions of climate policy, but emphasizing specific procedural aspects such as voice and representation can reduce perceptions that climate policies are harmful or ineffective, particularly among skeptics (Suiter et al., 2025).

At the same time, knowledge-based instruments and digital technologies offer new opportunities. In Chinese cities, digital policy instruments such as the digital economy, digital technology, digital infrastructure, and digital government have proven effective in reducing emissions and improving air quality, especially when designed as synergistic policy portfolios (Hu et al., 2025). This study highlights that the design of policy combinations is critical, as some interactions generate strong complementary effects, whereas others are substitutive and may worsen pollution.

Cross-study synthesis within the Policy Outcomes and Effectiveness theme shows that the effectiveness of climate policy is strongly shaped by the combination of approaches, institutional design, and the surrounding governance context. Integrated ecosystem-based approaches and policy mixes have been shown to generate mutually reinforcing benefits for socio-ecological resilience, pollution reduction, and land degradation prevention, provided that consistent policy frameworks and strong institutional support are in place. Governance quality emerges as a decisive factor, with inclusive, collaborative, and polycentric systems tending to produce stronger policy outcomes than highly top-down and closed governance structures.

At the same time, stable and targeted financing mechanisms are urgently needed to avoid dependence on short-term projects and to ensure the long-term sustainability of adaptation and mitigation strategies. Integration between adaptation and mitigation within national and subnational development planning remains weak in many countries, reducing long-term effectiveness and increasing the risk of maladaptation. Furthermore, citizen participation, public perceptions, and the use of knowledge-based and digital policy instruments have the potential to enhance policy effectiveness when designed with attention to justice, representation, and synergies across policy tools.

Taken together, these findings indicate that the effectiveness of climate policy does not depend solely on the existence of particular instruments but, more importantly, on how those instruments are combined, integrated, and implemented within specific governance, financing, and participatory contexts.



3.3.4 Political and Institutional Drivers

The analysis of the Political and Institutional Drivers theme shows that politics, institutional structures, and power relations across multiple levels of government play a critical role in shaping the direction and effectiveness of climate policy. Cross-study findings cluster into five main patterns: political ideology and dynamics, governance architecture and advisory institutions, knowledge politics and data gaps, participation, justice, and community-policy interfaces, and specific sectors and groups exposed to structural vulnerabilities. All articles within this theme demonstrate that climate adaptation and mitigation cannot be separated from political contexts, which often both facilitate and constrain climate action.

a. Ideologi Politik, Partisanship, dan Geopolitik

Several studies highlight the direct influence of political orientations on climate policy. In the United States, electric utilities in states dominated by the Republican Party invest less in energy efficiency than those in Democrat-controlled states, driven by both the direct influence of elected officials and indirect mechanisms such as green technology subsidies and energy efficiency scores (Adua & Clark, 2021). This study underscores that conservative partisanship tends to provide weaker support for energy efficiency agendas, even when such agendas offer potential economic benefits.

At the geopolitical level, the dynamics of rivalry and cooperation between India and China shape India's ambivalent climate policy. Security interests and strategic competition lead India to balance global commitments with national interests, particularly in developing domestic renewable energy value chains (Prys-Hansen & Kaack, 2024). In Nigeria, similar challenges are reflected in the evaluation of the Climate Change Act 2021, where dependence on fossil fuels, weak institutional capacity, corruption, and non-binding emission targets hinder implementation despite the presence of a legal framework (Olujobi & Odogbo, 2024).

Climate litigation also emerges as an important political arena. The 2021 ruling of the German Climate Constitutional Court illustrates how intergenerational justice narratives, the Fridays for Future movement, and the strategic use of international norms can influence public debate and pressure governments to strengthen climate protection (Steinkamp, 2023).

b. Governance Architectures and Advisory Institutions

Institutional architecture and advisory bodies play a significant role in shaping climate policy. A longitudinal analysis of the UK Climate Change Committee shows an evolution of recommendations from general and status quo-preserving advice toward more ambitious, specific, cross-sectoral recommendations that place greater pressure on the government to act, particularly since 2019 (Dudley et al., 2022). At the European Union level, the establishment of the Scientific Advisory Board within the framework of the European Green Deal strengthens epistemic leadership, yet also introduces potential tensions between independent scientific expertise and democratic legitimacy due to the risk of "shadow policymaking" if coordination with the European Environment Agency is not well managed (Giorgi, 2023).

In the Alpine region, the complexity of multi-level governance and institutional fragmentation hinders the development of comprehensive climate adaptation strategies, while local engagement remains limited and existing plans tend to be mono-sectoral without strong monitoring systems (Cattivelli, 2021). A similar situation arises in Lithuania, where governance of public health risks associated with climate change remains fragmented, with weak integration of climate and health agendas and limited stakeholder engagement (Proscviciute & Telesiene, 2025).

c. Politics of Knowledge, Data Gaps, and Anticipatory Governance

Several studies emphasize that knowledge and data are not neutral entities but are shaped by power relations that influence policy direction. In Cambodia, drought data gaps are understood as a form of "strategic environmental ignorance," in which the management of rainfall data, meteorological stations, and Mekong River information is politicized to maintain central government control and



export-oriented economic interests. This dynamic hinders local adaptation and prioritizes large-scale irrigation projects over community-based needs (Parsons, 2022).

In contrast, a study in Helsinki demonstrates how future vulnerability assessments that combine objectivist and subjectivist approaches through scenarios, participatory mapping, and SoftGIS can enrich understanding of vulnerability to heatwaves and floods while supporting more adaptive anticipatory governance (Jurgilevich, 2021). In Bolivia, the development of multi-level learning nodes through policy nodes, knowledge hubs, and pilot interventions has enhanced cognitive, normative, and relational capacities and strengthened the integration of science and policy in water governance (Gonzales-Iwanciw et al., 2021).

d. Participation, Justice, and the Policy–Community Interface

Many articles highlight the importance of justice, participation, and the relationship between national policies and community needs. In Bangladesh, the government's reactive, top-down, and growth-oriented approach (Reactive Approach of Limited Action) has created significant gaps with coastal community adaptation strategies. The study recommends a shift toward a proactive, participatory, and locally informed approach (Proactive Approach to Adaptation) that emphasizes social justice and multi-level coordination (Hossen et al., 2022).

Similar findings emerge in Zambia, where participatory climate governance requires strong political will, a multi-tier institutional framework, stakeholder inclusion with clearly defined roles, adequate financing, and the integration of local knowledge. The proposed Climate Action Coordination Model emphasizes the depoliticization of governance, independent technical oversight, and the integration of climate action into national development planning (Zulu et al., 2025). In Bologna, analysis of community-based adaptation pathways shows that despite a history of participation and decentralized institutions, power configurations and the dominance of public–private alliances often render citizen participation symbolic, creating risks of tokenism and issues of legitimacy (Fontana et al., 2025).

Studies on public perceptions of cost of living and inequality in the context of the climate crisis show that low-income groups perceive climate action and social welfare policies as interconnected issues. A lack of political trust and pressures from rising living costs can weaken support for climate policies if the policy design is not sensitive to social justice (Irwin, 2025).

e. Sectoral and Community-Specific Governance Challenges

Several studies highlight how political and institutional dynamics shape the vulnerability of specific sectors and communities. In the Nordic metal mining sector, companies tend to focus more on transition risks and compliance with mitigation policies, while the physical impacts of climate change are not treated as a priority. Adaptation activities remain limited, reactive, and constrained by regulatory gaps and insufficient internal capacity (Klein et al., 2022). In southern Chile, the responses of the Indigenous Pehuenche community to climate change are deeply shaped by a history of land dispossession, state policies, and dependence on external assistance. As a result, many strategies become maladaptive and reinforce vulnerability. The study emphasizes the need for policy reform and recognition of Indigenous rights to build equitable resilience (Yost, 2023).

In Greenland, fertility decisions are influenced by a combination of socio-economic factors, health, education, colonial legacies, and climate change. Inequalities between small settlements and the city of Nuuk illustrate how social and development policies, rather than climate impacts alone, shape family decisions and intergenerational vulnerability (Peterson et al., 2025). In Lithuania, fragmentation between health and climate policies and weak attention to vulnerable groups demonstrate the need for an integrative health–climate approach and stronger cross-sectoral cooperation (Prosceviute & Telesiene, 2025).

Cross-study synthesis reveals several key patterns. First, political ideology, partisanship, and geopolitics consistently influence the ambition and design of climate policies, either through support for energy efficiency



and decarbonization or through litigation and social movement pressure. Second, institutional architecture and advisory bodies determine the extent to which science can inform policy, with ongoing tensions between technocratic expertise and democratic legitimacy. Third, knowledge politics and data governance can strengthen anticipatory governance when designed inclusively, but may also be used strategically to maintain power and obstruct adaptation. Fourth, justice, participation, and community-policy interfaces are prerequisites for legitimate and effective climate governance, yet they are frequently constrained by top-down approaches, tokenism, and structural inequalities. Fifth, specific sectors and communities such as Indigenous peoples, the mining sector, public health systems, and low-income groups face vulnerabilities shaped by political history, social policies, and economic inequalities, and therefore require context-specific and justice-oriented policy designs.

Overall, the Political and Institutional Drivers theme underscores that the success of a fair and effective climate transition depends heavily on how political and institutional systems manage conflicts of interest, distribute power, and create space for the knowledge and voices of groups that have historically been marginalized.

4. DISCUSSION

The findings of this systematic review show that the effectiveness of climate change adaptation is strongly influenced by governance configurations, policy frameworks, and socio-political dynamics that shape the behavior of actors and institutions. At both local and national levels, adaptation is not merely a technical process but also a site of competing interests, institutional capacities, and political legitimacy that determines the extent to which adaptation strategies can be implemented in an equitable and sustainable manner. The findings across the four major themes, namely Barriers and Enablers, Policy Instruments and Approaches, Policy Outcomes and Effectiveness, and Political and Institutional Drivers, consistently indicate that structural constraints, power imbalances, and policy fragmentation are the most dominant factors weakening climate resilience across countries.

In many contexts, adaptation experiences an adaptation gap not due to a lack of risk awareness but because political and economic incentives tend to favor investments in highly visible hard infrastructure solutions rather than social interventions that reduce vulnerability structurally. In Chicago, for example, the severe 1995 heatwave prompted the city government to develop outreach programs targeting highly vulnerable populations such as the elderly. After these programs were implemented, mortality rates declined significantly in subsequent heatwaves (Klinenberg, 2015). However, despite this success, government investment patterns in many countries continue to show a strong preference for hard infrastructure, such as dams, levees, or seawalls, which are perceived as more tangible. After the major 1962 flood, Norfolk, Virginia constructed a large seawall rather than reducing exposure through relocation schemes and insurance mechanisms that could encourage movement away from low-lying coastal areas. As a result, the region remains highly vulnerable to sea level rise today (National Research Council, 2004). This pattern reflects the safe development paradox, where increased protection encourages further development in high-risk areas, ultimately increasing exposure and losses (Adger et al., 2005; Kates et al., 2006). The findings of this SLR show that similar dynamics emerge across countries in Asia, Africa, Europe, and Latin America, where adaptive infrastructure development often creates a false sense of security and increases long-term exposure.

Beyond the safe development paradox, the findings of this review show that the effectiveness of climate adaptation is strongly shaped by governance quality and political dynamics. Countries such as Bangladesh, Pakistan, Ethiopia, and Zambia face adaptation barriers due to weak inter-institutional coordination, dominant top-down approaches, and limited legitimacy of public participation. In the Global North, including Germany, the United Kingdom, Finland, and the Nordic countries, challenges tend to be more institutional, such as the dominance of technocratic frameworks, status quo bias, or reliance on consultative mechanisms that insufficiently account for social justice (Baru and Rini, 2021). Across both contexts, a common pattern emerges: the most successful adaptation efforts are those that integrate local knowledge, strengthen the capacities of



grassroots actors, and ensure meaningful public involvement in risk assessment and decision-making processes.

This review also reveals that adaptive capacity is strongly influenced by socio-economic factors and political identity. In Canada, India, and the United States, preferences for energy and adaptation policies are shaped more by political ideology and partisanship than by scientific needs. For example, electric utilities in conservative U.S. states tend to invest less in energy efficiency despite its economic benefits. Similarly, geopolitical rivalries such as those between India and China not only shape national security strategies but also influence climate policies and adaptation choices. Thus, adaptation cannot be understood merely as a technocratic response; it must be viewed as a political process shaped by power, identity, and strategic interests.

From the perspective of policy instruments, this SLR finds that the effectiveness of Climate Action Plans, carbon taxes, policy mixes, and adaptation financing mechanisms depends heavily on institutional capacity and cross-scale alignment. Although carbon taxes in Cameroon have strong potential to reduce emissions, the absence of a legal framework undermines implementation. Conversely, policy mixes in the agricultural sector in Italy significantly reduce soil erosion, demonstrating that integrated and responsive policy instruments can produce substantial environmental benefits. These policy innovations, however, continue to face challenges such as data limitations, technical capacity constraints, funding shortages, and political resistance that impede long-term implementation.

Overall, the findings of this review highlight that effective adaptation requires multilevel, integrative, and justice-oriented approaches. Participatory governance, adaptive policy instruments, alignment between mitigation and adaptation, and more equitable distribution of power among institutions and communities are essential for achieving sustainable reductions in vulnerability. Bridging the gap between planning and implementation calls for structural reforms, stronger institutional capacities, and a restructuring of political incentives toward long-term risk reduction rather than short-term, symbolic solutions. By understanding the complex interactions among institutions, policies, and socio-political factors, this study provides a robust foundation for designing climate adaptation that is more just, strategic, and future oriented.

Despite its systematic design, this review has several limitations that should be acknowledged. First, the literature search was limited to articles indexed in one or two major databases and included only English-language publications from 2021 to 2025. This restriction may have excluded relevant studies published in other languages, indexed in different databases, or published outside the selected timeframe. Second, the quality assessment relied on qualitative, relatively general parameters and did not include inter-rater reliability measures, which may introduce subjective bias. Third, the exclusive focus on journal articles excludes policy reports, government documents, and grey literature that could offer additional contextual insights into political processes and policy implementation. These limitations suggest opportunities for future research to broaden database coverage, adopt more standardized quality assessment methods, and integrate multiple forms of evidence to enrich understanding of climate policy dynamics.

5. CONCLUSION

This systematic review shows that the effectiveness of climate change adaptation is shaped by the interaction between institutional factors, policy instruments, socio-political dynamics, and the capacities of actors across different levels of government. Analysis of dozens of cross-country studies reveals that the most significant adaptation barriers arise from governance fragmentation, weak institutional coordination, technocratic bias, funding limitations, and a tendency among governments to prioritize visible infrastructure solutions over social and structural vulnerability reduction. Although there are notable examples of success, such as the reduction in heat-related mortality through social interventions in Chicago, many regions remain trapped in the safe development paradox, which increases long-term exposure and deepens climate risks.

These findings demonstrate that successful adaptation requires more than technical planning alone. Adaptation demands inclusive multilevel governance, integration between mitigation and adaptation,



alignment of policy instruments, and recognition of local knowledge and socio-economic conditions that shape vulnerability. Furthermore, political dynamics such as ideology, partisanship, and geopolitical rivalries have been shown to influence adaptation and mitigation decisions, and therefore cannot be disregarded when designing policy frameworks.

Overall, this review highlights the need for adaptation approaches that are more equitable, collaborative, and long term, placing the most vulnerable communities at the center of strategy. Institutional reform, capacity strengthening, cross-sectoral coherence, and a shift away from symbolic solutions toward substantive interventions are essential for enhancing climate resilience across regions. The findings of this study are expected to provide a foundation for developing more integrated and responsive climate policies, while also guiding future research on effective and justice-oriented adaptation governance.

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