

Sustainable Development in Climate Change in Southeast Asia: A Systematic Literature Review

Zrównoważony rozwój w kontekście zmian klimatycznych w Azji Południowo-Wschodniej: systematyczny przegląd literatury

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Abstract

The acceleration of the climate crisis demands both conceptual and implementation-level integration between Sustainable Development (SD) and Climate Action (CA), yet Southeast Asian literature still exhibits fragmentation that hinders policy effectiveness. This study aims to present a systematic synthesis that assesses how SD and CA are researched, articulated, and operationalized in the region, while also tracing theoretical consistency, empirical contradictions, and unmapped research gaps. Academically, this review is crucial for addressing sectoral biases in SDG studies; practically, it reinforces the need for more coherent cross-sector climate policies.

Using a Systematic Literature Review (SLR) of 22 core articles (2018–2025) rigorously selected from Scopus, the analysis employs systems thinking, SDG interlinkages, socio-technical transitions, and multi-level governance as synthesizing lenses. The findings indicate that although the literature is theoretically consistent regarding SD–CA interconnections, real-world implementation remains constrained by knowledge–behavior gaps, energy policy lock-ins, weak integration of local wisdom, and socio-technical barriers in the adoption of low-carbon technologies. Eight research gaps are identified, highlighting the need for integrative cross-disciplinary models and more robust causal methodologies.

This study contributes by providing a synthesis framework that enriches theoretical discourse while offering strategic direction for policymakers to accelerate climate transformation in Southeast Asia.

Key words: sustainable development, Climate action, Southeast Asia, socio-technical transitions, governance, Systematic Literature Review

Streszczenie

Przyspieszenie kryzysu klimatycznego wymaga integracji zarówno na poziomie koncepcyjnym, jak i wdrożeniowym między zrównoważonym rozwojem (SD) a Działaniami na rzecz klimatu (CA), jednak literatura dotycząca Azji Południowo-Wschodniej nadal charakteryzuje się fragmentacją, która zmniejsza skuteczność polityki. Celem niniejszego artykułu jest przedstawienie systematycznej syntezy, która oceni, w jaki sposób zrównoważony rozwój i Działania na rzecz klimatu są badane, artykułowane i wdrażane w regionie, a jednocześnie prześledzi spójność teoretyczną, sprzeczności empiryczne i niezidentyfikowane dotąd luki badawcze. Z naukowego punktu widzenia przegląd ten ma kluczowe znaczenie dla wyeliminowania sektorowych problemów w badaniach nad SDG; w praktyce wzmacnia on potrzebę bardziej spójnej międzysektorowej polityki klimatycznej.

Opierając się na systematycznym przeglądzie literatury (SLR) obejmującym 22 artykuły kluczowe (2018–2025), wybrane z bazy Scopus, w analizie wykorzystano myślenie systemowe, powiązania SDGs, transformacje społeczno-techniczne oraz zarządzanie wielopoziomowe jako soczewki syntetyzujące. Wyniki wskazują, że chociaż literatura jest teoretycznie spójna w zakresie powiązań między zrównoważonym rozwojem a Działaniami na rzecz

klimatu, praktyczne wdrożenie wciąż jest ograniczone przepaścią lukami między wiedzą a ludzkimi zachowaniami, blokadami polityki energetycznej, słabą integracją lokalnej wiedzy oraz barierami społeczno-technicznymi we wdrażaniu technologii niskoemisyjnych. Zidentyfikowano osiem luk badawczych, co podkreśla potrzebę przygotowania zintegrowanych modeli interdyscyplinarnych i bardziej konkretnego wykorzystywania metodologii przyczynowo-skutkowych.

Niniejszy artykuł stanowi wkład w ten proces, dostarczając ramy syntezy, które wzbogacają dyskurs teoretyczny, a jednocześnie wskazują decydom strategiczny kierunek przyspieszenia transformacji klimatycznej w Azji Południowo-Wschodniej.

Słowa kluczowe: zrównoważony rozwój, działania na rzecz klimatu, Azja Tenggara, przemiany społeczno-techniczne, zarządzanie, systematyczny przegląd literatury

1. Introduction

Sustainable Development, formulated through the framework of the Sustainable Development Goals (SDGs), and Climate Action as the core focus of SDG 13, has become one of the most urgent global agendas of the 21st century. The pressure to transition toward low-carbon socio-economic systems is further reinforced by the increasing frequency and intensity of climate risks, as well as scientific warnings regarding the safe limits of global warming (United Nations, 2015). The rapid growth of scientific publications over the past decade including an increase of more than 300% on the themes of climate action and sustainable development indicates rising academic attention to this issue. Research covering topics such as energy transitions (Alagoz & Alghawi, 2023) community vulnerability Lee B.D, (2023), and green financing illustrates the growing diversity of scientific approaches used to understand the complexity of climate change.

However, there is an important counterargument to the assumption that the rapid increase in research production automatically leads to more effective climate action. Although studies on mitigation and adaptation have expanded rapidly, reports from (UNEP, 2023) show that the pace of global emission reductions remains far off track from what is needed to limit warming to 1.5°C. At the same time, many countries have not yet met their Nationally Determined Contributions (NDCs), indicating an implementation gap between scientific knowledge and policy realization on the ground. These findings align with warnings (Adshead et al., 2023) which emphasize that the key barrier to climate action lies not only in the state of scientific knowledge but in the systemic integration of that knowledge into policy. Thus, despite significant growth in scientific literature, an integrated understanding of Sustainable Development and Climate Action has not yet been achieved, and knowledge fragmentation remains a major obstacle in global climate response efforts.

Previous literature shows a tendency for research to focus on specific sectors or issues, such as energy, agriculture, health, or green finance. While sectoral approaches can offer analytical depth, studies such as (Yamaguchi et al., 2023) assert that the SDGs are often examined in isolation, resulting in fragmented understandings. This fragmentation limits the ability of researchers and policymakers to evaluate how development and climate action influence each other within the context of SDG interlinkages. Such conditions underline the urgency of this study: there is a need for a comprehensive scientific synthesis to integrate cross-disciplinary findings, evaluate the consistency and contradictions within the research landscape, and identify areas that remain underexplored Maharana S (2025). Without a systematic synthesis approach, the likelihood of research overlap, thematic bias, and non-strategic research directions increases, ultimately risking a slowdown in the pursuit of climate solutions.

To address these challenges, the Systematic Literature Review (SLR) approach becomes crucial, as it enables a methodological and transparent process of filtering, evaluating, and synthesizing scientific evidence. The SLR provides a robust framework for identifying patterns of findings, conceptual debates, and unmapped scientific gaps. This approach is also highly relevant for analyzing SDG interlinkages and assessing the extent to which socio-technical transition theories have been used to interpret system-change dynamics in climate action. Through this method, the study functions not only as a compilation of literature but also as a strategic contribution that strengthens the evidence base for policymaking, program planning, and cross-sector research prioritization.

Based on this background, this paper aims to provide a comprehensive systematic literature review of the relationship between Sustainable Development and Climate Action. To achieve this goal, the study is guided by three research questions: (1) What are the dominant themes, analytical focuses, and theoretical approaches in studies on Sustainable Development and Climate Action? (2) How do patterns of consistency, contradiction, and conceptual debate emerge in the literature concerning the interlinkage between the two concepts? (3) What research gaps and future research directions are needed to strengthen the integration of sustainable development and climate action at the global level? Answering these questions offers theoretical contributions in the form of a comprehensive mapping of synthesized knowledge, and practical contributions in the form of strategic recommendations for researchers, funding bodies, and policymakers to direct investment toward the most relevant areas for accelerating climate solutions.

Despite the significant growth of research on Sustainable Development and Climate Action, the existing literature still exhibits thematic fragmentation, sector-based approaches, and limited conceptual integration between the two fields. In addition, inconsistencies and contradictions persist across prior studies, while systematic identification of research gaps remains limited. Consequently, a comprehensive understanding of the relationship between Sustainable Development and Climate Action has not yet been achieved, and the potential academic contribution to global climate targets remains underutilized.

2. Methodology

We aim to synthesize policy research particularly literature on Sustainable Development within the context of Climate Action to address three core research questions. This review is intended to support policymakers in making more evidence-informed decisions, especially in responding to the global climate crisis. In this regard, the paper produces a form of *pragmatic science* that blends theoretical–methodological rigor with practical relevance (Tranfield et al., 2003). Furthermore, this review contributes to the academic community by identifying research gaps related to future policy capacity.

This study employs a Systematic Literature Review (SLR) approach to examine research trends on Sustainable Development within the context of Climate Action. The method enables a comprehensive qualitative synthesis of existing findings and the identification of research gaps. Data were collected from the Scopus database using the primary keywords *Sustainable Development* combined with *Climate Action*, limited to publications from 2018–2025 and restricted to journal articles and conference papers. The search was further narrowed to works affiliated with institutions in Southeast Asia, resulting in 93 relevant documents. Content analysis was then conducted on the selected articles to identify key issues, challenges, and research gaps related to Sustainable Development and Climate Action.

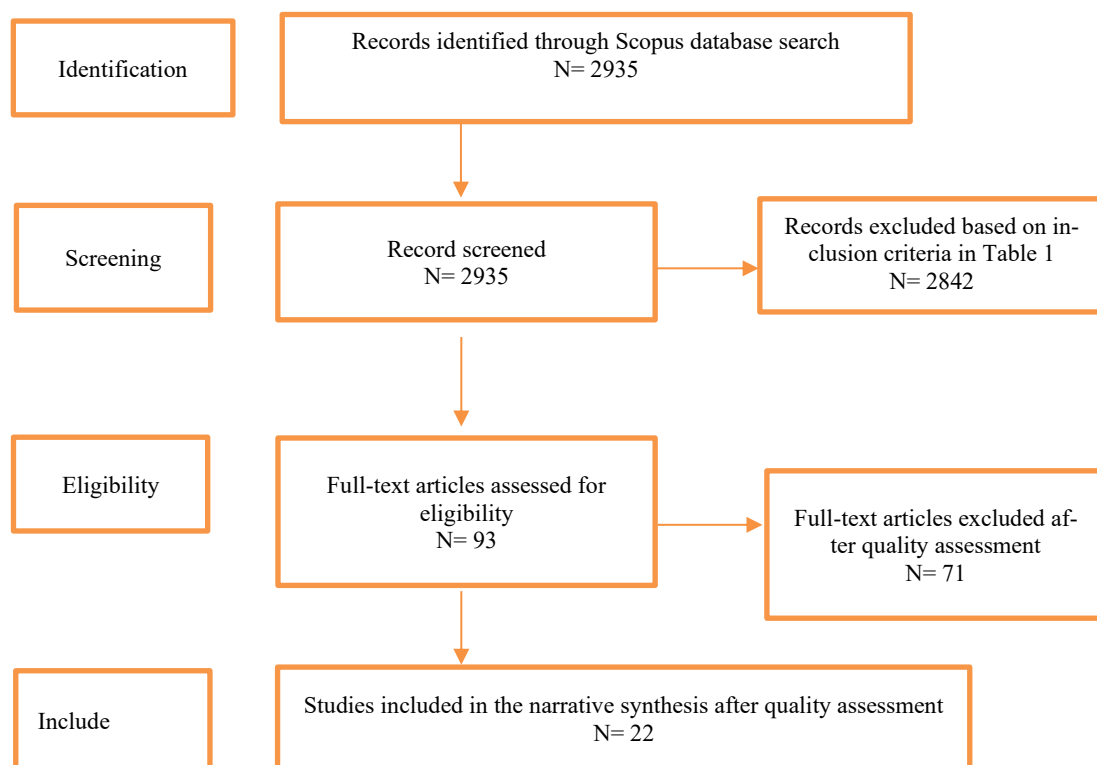


Figure 1. PRISMA flow diagram

1. Scope delimitation: Prior to formulating the research questions, we established inclusion criteria aligned with the aims of the study. Only original research articles whether quantitative, qualitative, or review-based that addressed at least one core issue (Sustainable Development and Climate Action in Southeast Asia) were considered. Eligible studies also needed to demonstrate methodological transparency by explicitly outlining their research procedures.
2. Study identification: Relevant publications were gathered from the Scopus database for the period January 2018 to November 2025. To reduce potential bias, we applied a predefined and mutually agreed-upon search strategy, as detailed below:
(TITLE-ABS-KEY ("sustainable development") AND TITLE-ABS-KEY ("climate action")) AND PUBYEAR > 2009 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA , "ENVI") OR LIMIT-

- TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "ENER") OR LIMIT-TO (SUBJAREA , "EART")) AND (LIMIT-TO (AFFILCOUNTRY , "Brunei Darussalam") OR LIMIT-TO (AFFILCOUNTRY , "Indonesia") OR LIMIT-TO (AFFILCOUNTRY , "Myanmar") OR LIMIT-TO (AFFILCOUNTRY , "Malaysia") OR LIMIT-TO (AFFILCOUNTRY , "Singapore") OR LIMIT-TO (AFFILCOUNTRY , "Thailand") OR LIMIT-TO (AFFILCOUNTRY , "Viet Nam")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA , "all"))
3. Study screening: Titles, abstracts, and keywords of each article were independently evaluated using the predetermined inclusion criteria. Any disagreements that arose during this stage were resolved through discussion until a consensus was reached.
 4. Description and mapping: A descriptive mapping was developed to systematically illustrate the research activities in relation to each research question. All studies that passed the screening stage were read in full to summarize their methodologies and key findings, after which they were categorized according to the relevant research questions. The resulting descriptive map is presented in Table 1.

Table 1. The inclusion criteria presented in this table have a limitation in geographical coverage: the search was restricted to only seven Southeast Asian countries, source: Research Processing

Typology	Inclusion criteria
Topic	Related to the concept of Sustainable Development and/or Climate Action (Mitigation/Adaptation), or at least one climate-related SDG.
Range	Published between 1 January 2018 and 1 November 2025
Geography Coverage	Focuses on issues, case studies, or policies relevant to Southeast Asian countries
Transparency	Presents the research methodology explicitly

5. Quality and relevance assessment: The methodological quality of each study was independently evaluated using appraisal tools tailored to the respective research methods. For qualitative research and review articles, we applied the CASP qualitative checklist (Mbozi et al., 2020) Case studies and survey-based research were assessed using the CEBMa checklist (Center for Evidence-Based Management, n.d.), while cross-sectional studies were evaluated with the JBI checklist (Moola et al., 2017). Mixed-methods research was appraised using the Mixed Methods Appraisal Tool (MMAT) (Pluye et al., 2011).
6. Synthesis of study findings: The findings were summarized and presented through a narrative synthesis. This approach was selected for its simplicity and its focus on integrating evidence without aiming for statistical generalization (Tranfield et al., 2003). The method organizes diverse research outcomes into a coherent narrative or concise summary tables that facilitate interpretation (EPPI-Centre, 2010). We first provided a detailed descriptive analysis in tabular form, followed by thematic analysis structured around three dimensions of policy capacity: analytical, operational, and political.
7. Conclusions and recommendations: Drawing on the synthesized findings, we formulated conclusions and recommendations intended to support decision-makers, public managers, and the broader policy research community.

3. Results and discussion

3.1. Nature of the included studies

We identified 2,935 studies suggested by the database. Of the 2,935 studies, 2,840 were excluded ($N = 93$) because they did not meet our inclusion criteria (see Table 1). Before conducting full-text reading and rigorous methodological assessment, 71 studies were excluded, resulting in 22 studies included for review. Figure 1 provides the PRISMA flow diagram illustrating the number of studies included and excluded at each stage of the review process. Table 2 summarizes the characteristics of the included studies by country and links them to the research questions in Table 3. The discussion is developed by drawing on major theoretical frameworks such as Sustainable Development Systems Thinking, Socio-Technical Transitions (Geels, 2002), SDG Interlinkages (Le Blanc, 2015), and Multi-Level Climate Governance, all of which serve as the argumentative foundation for understanding the complex relationship between sustainable development and climate action.

Table 2 presents a summary of the characteristics of the 22 selected studies. The table is divided into three main categories: countries, type of literature, and research methods. In terms of countries, most studies were conducted in Indonesia (13 studies, 59.1%), followed by Malaysia (5 studies, 22.7%). Thailand contributed 2 studies (9.1%), while Brunei Darussalam and Myanmar each contributed 1 study (4.5%). Regarding the type of literature, the majority were primary studies (15 studies, 68.2%), while secondary studies accounted for 7 studies (31.8%). In terms of research methods, qualitative methods were the most commonly used (9 studies, 40.9%), followed by quantitative methods (8 studies, 36.4%). Mixed methods were used in 3 studies (13.6%), and case study approaches were used in 2 studies (9.1%).

Table 2. Summary of literature characteristic (N=22), source: Research Processing

Summary of literature characteristic	N (22 Total)	%
Countries		
Brunei Darussalam	1	4,5
Indonesia	13	59,1
Malaysia	5	22,7
Myanmar	1	4,5
Thailand	2	9,1
Type of literature		
Primary	15	68,2
Secondary	7	31,8
Methods		
Case study	2	9,1
Qualitative	9	40,9
Quantitative	8	36,4
Mix methods	3	13,6

3.2. Discussion

In the following section, we synthesize the findings narratively. We present observations thematically, using research questions as a guide.

Table 3. Summary of the studies (N = 22)

No	Study	Research objectives	Setting	Type & methods	Main findings	R Q1	R Q2	R Q3
1	Khaerudin; Arita Marini; Rezeqi Hardam Saputro; Asep Marfu	Identifying supporting and inhibiting factors in implementing technology-based education to enhance sustainability awareness	Indonesia	Primary; CE-BMa Survey Checklist (quantitative survey-based study)	Technology supports learning, but sustainability must be taught explicitly; barriers include access and readiness	Y Y	Y Y	Y Y
2	W. A. Sari; W. Artika; R. S. Oktari; Safrida; H. Rahmatan; D. Sasaki	Assessing ESD competence, environmental empathy, their relationship, and providing recommendations for the SDGs	Indonesia	Primary; MMAT (Mixed-Method Appraisal Tool)	ESD competence is fairly good; correlation with empathy is low. ESD explains only a small portion of empathy. Students understand issues but their actions are weak, influenced by internal-external factors and limited direct emotional experience.	Y	Y	Y
3	Syifa Hanifa; Djati Mardiatno; Dina Ruslanjari	Assessing coastal sustainability potential, determining the strongest sub-district, and developing a simple Z-score method for SDG 11 & 13 Indonesia	Indonesia	Secondary; JBI Checklist for Analytical Cross-Sectional Studies	Gombong the lowest; others are moderate. Indicators complement each other. Four indicators form the <i>Prism of Sustainability</i> . Sustainable communities support SDG 11 & 13, with needs for additional data and validation	Y	Y	Y
4	Zarith Sofia Jasmi & Nurfarhana Hassan	This study compares determinants of SDG achievement in 215 countries across four income groups using PCA and FACS to identify	Malaysia	Primary; JBI Checklist for Analytical Cross-Sectional Studies	High-income countries are constrained by emissions; low-income countries by poverty; PCA-FACS highlights separation between environmental and socio-economic factors in SDG achievement	Y	Y	Y

		the most significant variables and socio-economic–environmental linkages						
5	Tantri Puspita Yazid, Welly Wirman, Anuar Rasyyid, Ringgo Eldapi Yozani, & Hevi Susanti	Formulating a community empowerment–based communication model for forest fire prevention through PRA and coordination of local actors	Indonesia	Primary; CASP Qualitative Checklist	Cross-actor communication and empowerment strengthen wildfire prevention, but barriers arise from social, linguistic, technical, and ecological factors	Y	Y	Y
6	Suthirat Kit- tipongvises & Jessada Salathong	Examining the integration of SDG13 at CU in policy, curriculum, research, and public activities	Thailand	Primary study – <i>Mixed-method</i> : Quantitative Text Analysis + Content Analysis.	CU integrates SDG13 through net-zero policies, interdisciplinary curricula, climate research, and outreach initiatives such as Chula Century Park and low-carbon tourism	Y	Y	Y
7	Mohamad et al	Reviewing best teaching practices for the new climate policy and law program from expert perspectives	Malaysia	Primary study – Qualitative.; <i>CASP Qualitative Checklist</i> .	Five best practices identified: service learning, global learning, article writing, PBL, and roleplay to strengthen understanding of climate policy and law	Y	Y	Y
8	Angelina, C. M., Tahara, M., Audrey, T., Evelyne, V. Y. San, & Rukmini, E	Summarizing and mapping forms of community education on food waste in Indonesia and their contributions to the SDGs	Indonesia	Secondary study – Systematic Review; CASP Review Checklist.	Food waste education is campaign-led, mainly targets adults; activities vary; challenges relate to technical skills; contributes to food efficiency and emission reduction	Y	Y	Y
9	Haslinda Mohd Anuar et al.	Reviewing climate program structures in Malaysian universities to identify trends and the need for a new postgraduate program in climate policy & law	Malaysia	Primary study – Qualitative; Constant comparative approach & Thematic analysis; CASP Qualitative Checklist.	Malaysia lacks a dedicated climate law postgraduate program; existing programs are science-dominated. FGD highlights the need for a strong law–policy curriculum to support climate law literacy, regulation, and SDG13	Y	Y	Y
10	Darmastuti, S. A., Nazar, I. A., & Setyawan, A. D	Examining plant diversity in ProKlim communities, identifying medicinal/food plants, assessing adaptation–mitigation perceptions, and contributions to SDG13	Indonesia	Primary study – Mixed quantitative–qualitative; MMAT (Mixed Methods Appraisal Tool)	56 plant species identified; chili and lemongrass show high usage; strong ethnobotanical and ICF values. ProKlim perceptions are highly positive and support adaptation–mitigation through food security and vegetation increase	Y	N	Y
11	Mitarlis; Azizah, Utiya; Yonata, Bertha	Linking education, green chemistry, and the SDGs; integrating	Indonesia	Primary study – Exploratory research (qualitative-	Applying five green chemistry principles in small-scale labs im-	Y	N	Y

		green principles into Basic Chemistry; testing learning models via observation and lab tests; evaluating knowledge improvement via pre-post test		dominant); CASP Qualitative Checklist	proves student understanding (pre <60% → post >80%) and supports SDG12–13, showing curriculum effectiveness			
12	Hardiman, Denitha Putri; Nuraniwati, Tri	Analyzing preferences and semantic prosody of the word <i>sustainable</i> in news, examining environmental and non-environmental contexts, and how media represent it in climate and SDG discourse	Indonesia	Primary study – Corpus-based qualitative linguistic analysis	<i>Sustainable</i> has broad associations (environmental, SDGs, social, economic) with predominantly positive prosody; media frame it as a valuable concept despite ongoing criticisms of <i>sustainable development</i> .	Y	Y	Y
13	Shaari, N. F.; Fadzil, A. S. A.; Aziz, N. A.; Zainoddin, A. I.; Jalal, M. Z. H. A.; Harun, Q. N.; Hassim, N. H.; Mohamad, A.; & Sulaiman, C.	Assessing changes in Malaysian flight behavior during/post COVID, impacts on WTP for carbon offset, knowledge of aviation emissions, and implications for climate policy (SDG 13)	Malaysia	Primary study – Survey-based quantitative research; CE-BMa – Survey Checklist	Pandemic reduced flight frequency; 69% willing to pay offsets despite low emissions knowledge; WTP around RM 20. Emission education needed to strengthen aviation climate policy support	Y	Y	Y
14	Asteria, D., Brotosusilo, A., Negoro, H. A., & Sudrajad, M. R	Customary law and traditional knowledge strengthen SFM and climate mitigation; Indigenous communities are vital for conservation and must be integrated into Indonesian forest policy	Indonesia	Secondary literature JBI – Systematic Review of Text & Opinion	Customary zoning, prohibitions, and TEK prevent deforestation, support adaptation–mitigation, and conservation. Challenges include modernization and lack of formal recognition; integration requires strengthened Indigenous rights and collaboration	Y	Y	Y
15	Handayani, K., & Filatova, T.	Assessing alignment of Indonesia’s power transition with Paris/NDC, contributions to SDG7–13, COVID-19 impacts, and positive–negative interactions with other SDGs	Indonesia	Secondary; JBI Checklist for Analytical Cross-Sectional	Misalignment found between RUPTL–NDC; energy sector provides many SDG co-benefits but also land pressures; pandemic reduces demand but strengthens RE; realignment needed	Y	Y	Y
16	Pongsiri, M.J., & Bassi, A.M.	Systems-based approach for integrated understanding of climate–health through HIA, im-	Thailand	Secondary; Commentary / Conceptual Analysis; CASP – Qualitative	Climate–health is complex; requires systems thinking via HIA, impact quantification, and policy integration; supported by nature-	Y	Y	Y

		pact quantification, and global-national policy integration Thailand			based solutions, innovative financing, and mandatory health analysis			
17	Kyaw Myo Linn	Myanmar is highly climate-vulnerable and responds through UNFCCC-INDC-NAPA policies, cross-sector mitigation-adaptation, and international cooperation, but still needs funding, technology, and capacity building	Myanmar	Secondary; CASP – Review	Myanmar is highly climate-vulnerable with existing policies and mitigation-adaptation actions, but faces capacity, financing, and integration challenges.	Y	Y	Y
18	Hilal Najm Al-Deen Moneer, Komariah, Ramelan Ari Handono, & Keigo Noda	Monitoring GWS Sragen trends (2003–2024) using GRACE-GLDAS-GEE, linking to SDG6-13, identifying El Niño/drought periods, and giving recommendations	Indonesia	Primary quantitative; JBI Checklist	GWS Sragen decreased 15–20% with strong seasonal patterns and severe depletion during El Niño/drought; GRACE-GLDAS-GEE effective for monitoring; recommendations include MAR, irrigation efficiency, extraction regulation	Y	Y	Y
19	Anita Puspita Negara et al.	Assessing the role of local wisdom in Indonesia’s climate action across waste, forest fires, food, urban, and ProK-lim; identifying policy gaps and recommending frameworks connecting local practice with modern policy and technology	Indonesia	Secondary study; CASP Review Checklist	Local wisdom supports mitigation-adaptation but weak integration with national policy; hybrid models with institutional and financial support needed	Y	Y	Y
20	Nur Syahirah Hatta., et alHatta, Farihahusnah Hussin, Lai Ti Gew, Hatta., et alKheiredine Aroua	Optimizing CO ₂ adsorption using amino-acid-modified palm kernel activated carbon via process variable identification, RSM modeling, validation, and characterization	Malaysia	Primary; JBI Checklist for Experimental Studies	Gas flow rate and temperature strongly affect adsorption; optimal conditions yield 1.18 mmol/g; RSM accurate; characterization shows successful amino acid impregnation improving CO ₂ capacity	Y	Y	Y
21	Syairuniza Suni, Muhammad Haarith Firdaus, Fifi Faulina Zailani, Stefan Gö-	Assessing public acceptance including religious feasibility for ablation of RWH using extended TAM; identifying socio-technical-cost barriers;	Brunai Darussalam	Primary; JBI Checklist for Analytical Cross-sectional Studies	Acceptance determined by PU-PEU-ATU-ITU, knowledge, cost, technical barriers; majority support RWH (even for ablation); education and technical-financial support needed	Y	Y	Y

	deke, Raihana Mohd Raffi, Pg Emeroylariffion Abas	providing policy recommendations						
22	Kevin Sutanto, Olivia Christina, Dedy Rony Putra Nadapdap, Lim Sanny	This study aims to examine the factors influencing electric vehicle purchase intention in Jakarta	Indonesia	Primary; JBI Checklist for Analytical Cross-Sectional Studies	Environmental awareness, economic benefits, performance expectations, and charging infrastructure shape attitudes driving EV purchase intentions; adoption requires more charging stations, education, and incentives	Y	Y	Y

Note: Y= Yes, N=No

3.2.1. Dominant themes in literature (RQ1): from fragmentation to integration

A review of the twenty-two studies analyzed shows that the literature on Sustainable Development and Climate Action in Southeast Asia has developed within a fragmented landscape, yet it exhibits an increasing tendency toward stronger conceptual integration. Although each study is rooted in a specific sector or domain such as education, governance, low-carbon technology, or local knowledge the collective pattern reflects four major interconnected themes that characterize the dynamics of sustainable development in the region.

The first and most dominant theme is sustainability education and human capacity-building, as reflected in studies such as (Khaerudin et al., 2025; Mitarlis et al., 2023; Hatta M., et al., 2025). These studies emphasize that sustainability literacy is a crucial foundation for shaping climate awareness among future generations, yet they also reveal significant complexities. Khaerudin et al. show that technologies such as IoT and big data enrich learning experiences but do not automatically foster internalization of sustainability values. Meanwhile Sari W. A (2025) find that students possess strong Education for Sustainable Development (ESD) competencies but display low ecological empathy and limited real-world action, reinforcing global findings on the imbalance between knowledge and behavior. Conversely, (Mitarlis et al., 2023). demonstrate that more practice-oriented pedagogical designs such as integrating green chemistry into laboratory work can significantly improve understanding, though the study also highlights that long-term behavioral change requires more systemic interventions. Overall, this body of educational research represents a consistent theme: sustainability transformation must begin with literacy, but its success is strongly shaped by social, emotional, and institutional contexts.

The second strongly emerging theme concerns climate governance and development policy, as seen in studies (Handayani & Filatova, 2021; Jasmi Z.S., Hassan N, 2024; Linn K. M, 2020; Negara et al., 2025; Pongsiri & Bassi, 2021). This literature shows that sustainable development cannot be separated from complex political, economic, and institutional contexts. (Handayani & Filatova, 2021), reveal that Indonesia's energy transition is not aligned with national climate commitments due to inconsistencies between policy documents such as the RUPTL and the NDC, reflecting the political-economic dynamics of the energy sector. (Negara et al., 2025), add that the success of climate action at the local level is heavily influenced by institutional structures, local government capacity, and social cohesion. In the Myanmar context. Linn K. M (2020) shows that although there is formal commitment to the UNFCCC, NDC, and NAPA, weaknesses in financing, technology transfer, and institutional capacity hinder climate action implementation. Meanwhile, emphasize that climate issues are closely intertwined with the health sector and require a more integrated systems-based approach. In Malaysia, (Jasmi & Hassan, 2024) show that determinants of SDG achievement vary widely depending on a country's income level, underscoring that global development governance is not homogeneous. Collectively, these studies illustrate a thematic pattern in which climate governance in Southeast Asia remains partial and often contradictory, even though the direction toward integration is becoming more evident.

The third prominent theme is the role of technological innovation and the transition toward low-carbon systems. This is clearly reflected in studies such as Sutanto et al. on electric vehicle adoption, (Hatta et al., 2025) on CO₂ adsorption using palm-based biomass, research on IoT-big data in sustainability education, and (Hilal et al., 2025), on GRACE-GLDAS-based monitoring of groundwater stress. These studies show that technology serves as one of the strongest catalysts for accelerating sustainable development goals. (Sutanto et al., 2025) highlight the importance of environmental awareness, perceived economic benefits, charging infrastructure, and performance expectations in shaping intentions to purchase electric vehicles a concrete representation of the ongoing energy transition in major Southeast Asian cities. (Hilal et al., 2025) demonstrate how biomass waste-based materials can contribute to emissions reduction through improved CO₂ adsorption capacity. (Hilal et al., 2025) also show how satellite and spatial data technologies play a major role in mapping climate impacts on water resources. However,

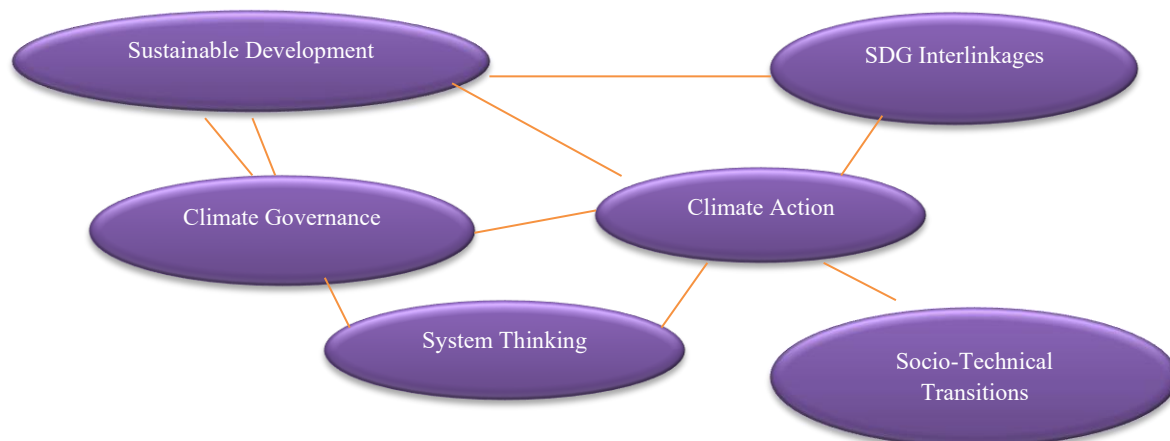
these studies also underline significant challenges: infrastructure gaps, high technological costs, uneven digital literacy, and limited technical capacity. Thus, technological innovation is positioned not only as a solution but also as a source of new challenges within the context of climate justice.

The fourth theme one of the most distinctive patterns in Southeast Asian literature is the role of local, socio-ecological knowledge and community resilience. Studies such as (Asteria et al., 2021; Negara et al., 2025) agroforestry research, and ProKlim analyses show that local communities possess strong capacities to develop adaptation strategies based on traditional practices such as landscape management, medicinal–food plants, ritual knowledge, and customary spatial governance. Practices such as agroforestry have been shown to improve food security while maintaining biodiversity, whereas customary law in forest management provides robust informal mechanisms for preventing deforestation. However, the literature also shows that the integration of local knowledge into national policy remains very weak. (Asteria et al., 2021; Negara et al., 2025) find that although local wisdom is effective, it is rarely incorporated into formal policy design, causing many development interventions to fail when implemented at the community level. This theme highlights an intriguing dynamic: local knowledge is one of the most effective elements of climate adaptation, yet also the least structurally recognized.

The four major themes emerging from the twenty-two studies indicate that research on Sustainable Development–Climate Action in Southeast Asia is developing in a sectoral manner but contains strong seeds of integration. Sustainability education addresses human capacity-building; climate governance highlights political and institutional structures; technological innovation opens pathways for energy transition; and local knowledge provides ecological and social foundations for long-term resilience. Viewed collectively, these themes show that Southeast Asian literature is gradually moving from a single-sector understanding toward a more holistic framework, although the process remains in its early stages.

To understand how these four major themes intersect in the Southeast Asian literature, a conceptual framework is needed to map cross-sectoral linkages between sustainable development, climate governance, technological innovation, and socio-ecological dynamics. The diagram below presents a synthesis of these relationships by illustrating how each element contributes to the integration between Sustainable Development and Climate Action. Present conceptual framework illustrating the interrelationship between Sustainable Development, Climate Action, SDG interlinkages, Climate Governance, Systems Thinking, and Socio-Technical Transitions. The diagram shows Climate Action as the central connecting element linked to governance systems, sustainability goals, and socio-technical transformation processes, indicating that effective climate action depends on integrated and interconnected sustainability approaches.

Diagram 1. Integrating Sustainable Development & Climate Action, source: Research Processing



3.2.2. Consistency, contradictions, and conceptual debates in the literature

This review finds that the Sustainable Development–Climate Action literature in Southeast Asia exhibits patterns of theoretical consistency alongside empirical contradictions that help explain why development–climate integration remains slow. These consistencies are evident across studies that confirm systems thinking, socio-technical transitions, SDG interlinkages, and governance complexity. However, numerous studies also reveal methodological divergences, implementation gaps, and structural misalignments that pose major obstacles to achieving SDG 13 in the region.

The strongest consistency appears in the relationship between development–climate issues and systems thinking (Meadows, 2008; Serman, 2000). (Handayani & Filatova, 2021) show that Indonesia’s energy transition is heavily

shaped by political–economic structures and conflicts of interest within the fossil fuel sector. This finding is reinforced by (Hilal et al., 2025) who identify systemic interconnections between climate, groundwater, food, and energy in Sragen Regency, where climate pressures affect all subsystems simultaneously. Meanwhile, (Negara et al., 2025) stress that the effectiveness of climate action is significantly influenced by social capacity, institutional capability, and the functionality of community structures.

Another consistency emerges when these findings are linked with SDG interlinkages theory Lee B. D (2015). Studi (Darmastuti et al., 2024) demonstrate through the ProKlim program that climate action (SDG 13) is directly intertwined with food security (SDG 2), clean water (SDG 6), and terrestrial ecosystems (SDG 15). (Asteria et al., 2021) strengthen this through a study of customary law, showing that Indigenous governance contributes significantly to mitigation through forest protection. At the same time, (Hatta et al., 2025) show that CO₂ adsorption technology derived from palm waste supports the link between sustainable consumption–production (SDG 12) and climate action (SDG 13). (Sutanto et al., 2025) demonstrate how electric vehicle adoption connects SDG 7 and SDG 13 through transport decarbonization. Collectively, these studies affirm that siloed approaches are no longer relevant.

The relevance of socio-technical transitions theory Geels F. W (2002) is also strongly visible. Low-carbon innovations appear across several studies: EV adoption (Sutanto et al., 2025), IoT-based sustainability education (Khaerudin et al., 2025), and CO₂ adsorption technology (Hatta et al., 2025). All three show that innovations are moving from the niche toward the regime level but continue to face barriers related to regulation, infrastructure, and social resistance.

Despite these consistencies, the literature also reveals several important contradictions. In sustainability education, (Sari et al., 2025) find that students have strong ESD competencies but low empathy and environmental action. Conversely, (Mitarlis et al., 2023) show that green chemistry learning significantly improves understanding. Meanwhile, (Khaerudin et al., 2025) report that digital technologies can increase knowledge but do not automatically shape behavior. These contradictions highlight that knowledge alone is insufficient (a critique of the knowledge deficit model).

A second contradiction appears in energy policy. (Handayani & Filatova, 2021; Linn K. M, 2020) show that while national climate commitments appear ambitious on paper, implementation remains constrained by short-term interests, fossil fuel subsidies, and structural dependence on coal. This reflects the phenomenon of carbon lock-in Unruh G. C (2000)

A third contradiction arises in the realm of local knowledge. Although, (Asteria et al., 2021; Negara et al., 2025), agroforestry studies, and ProKlim evaluations agree that local knowledge is effective for adaptation and mitigation, they also show that national policy still lacks mechanisms for formal integration. This aligns with Berkes F. (2017) critique regarding power imbalances in natural resource governance.

The final contradiction appears in technological dynamics. (Khaerudin et al., 2025) highlight technology-access gaps in education. (Sutanto et al., 2025) show cost and infrastructure barriers for EVs. Meanwhile, global literature warns of digital divide risks associated with big data and AI. Thus, technology can serve as both a solution and a source of new inequalities.

Overall, the findings from these 22 studies reveal an ambivalence between theory and practice: theoretically, the literature aligns with global paradigms on development climate integration, but empirically, it remains hindered by policy misalignment, weak institutional capacity, socio-technical resistance, and power imbalances. These results underscore that the integration of sustainable development and climate action in Southeast Asia remains in its early stages and requires systemic reforms involving technology, policy, and society.

3.2.3. *Key debates in the literature (RQ2)*

Debates concerning the relationship between sustainable development and climate action in Southeast Asia reveal the complex dynamics of systemic transformation. One of the most prominent debates centers on whether climate action should be driven primarily by technology or by community-based approaches. The technology-oriented body of literature such as studies on electric vehicle adoption by (Sutanto et al., 2025), IoT-based sustainability learning by (Khaerudin et al., 2025), IoT-based sustainability learning by (Hatta et al., 2025) assumes that technical innovations can offer scalable and efficient solutions. This approach aligns techno-solutionism perspectives in the energy transition literature.

Conversely, community-based studies emphasize the importance of social context and local knowledge as the foundation for sustainable adaptation. (Negara et al., 2025) show how community practices such as localized waste management, customary-based wildfire prevention, and agroforestry serve as effective adaptation strategies. Findings from (Asteria et al., 2021) on customary law and ecological conservation further reinforce this argument. This consistency aligns with social-ecological systems theory Berkes F (2017) which emphasizes that local knowledge plays a central role in environmental resilience. At the same time, these findings suggest that technology often fails without social support, whereas social capital alone cannot scale innovations without technical assistance. In this context, the literature appears to be moving toward hybrid climate governance models that combine the strengths of technology and community approaches.

The second debate concerns whether the SDGs function as a transformational framework or merely as an administrative checklist. Many studies show that although the SDGs are used as normative planning guidelines, implementation remains symbolic. (Handayani & Filatova, 2021) find that although Indonesia's NDC targets are ambitious, sectoral energy policies such as the RUPTL still reflect fossil fuel dominance. Linn K. M (2020) identifies a similar pattern in Myanmar, where climate policies are formally established but weakly implemented due to capacity limitations. These findings support (Vuuren et al., 2022) argument regarding the SDG implementation gap the disparity between national commitments and actual structural transformation.

The third debate arises in discussions about whether centralized or decentralized climate governance models are most effective. Southeast Asian countries exhibit diverse governance dynamics: Thailand and Malaysia are more centralized (Anuar et al., 2024; Kittipongvises & Salathong, 2024), while Indonesia adopts a more decentralized, hybrid model combining community-based approaches with national policies (Asteria et al., 2021; Darmastuti et al., 2024). Myanmar Linn K. M (2020) lies somewhere in between, whereas Brunei presents a religio-cultural model of environmental technology acceptance, such as in rainwater harvesting (Sunı et al., 2025). This variation shows that no single climate governance model is universally applicable, reinforcing governance complexity theory Unruh G. C (2000) which emphasizes the presence of political, social, and economic lock-ins that affect policy effectiveness.

Overall, these debates illustrate that the Sustainable Development–Climate Action literature in Southeast Asia not only enriches empirical understanding but also expands theoretical discourse on how systemic change can be achieved. The tensions between technology and community, normativity and implementation, and centralization and decentralization show that climate transformation is a multidimensional process requiring cross-level and cross-sector integration. This aligns with socio-technical transitions theory Geels F. W (2002) SDG interlinkages Lee B. D (2015) and dynamic systems principles (Meadows, 2008; Sterman, 2000)

3.2.4. *Research Gaps and Future Research Agenda (RQ3)*

The review of 22 core studies along with more than sixty additional references shows that research on Sustainable Development and Climate Action in Southeast Asia still contains several fundamental gaps that hinder both conceptual and implementation-level integration. Although the literature demonstrates consistent findings in several dimensions such as SDG interlinkages, the importance of institutional capacity, and the roles of technology and communities epistemological and methodological frictions continue to emerge, indicating the need for a more structured future research agenda.

First, research in the region remains dominated by sectoral rather than integrative approaches. Most studies focus on a single issue such as energy (Handayani & Filatova, 2021), water (Hilal et al., 2025), education (Khaerudin et al., 2025; Mitarlis et al., 2023; Sari et al., 2025), food waste (Angelina et al., 2024), or electric vehicle adoption (Sutanto et al., 2025). However, studies such as (Negara et al., 2025) dan (Asteria et al., 2021) show that cross-sectoral interactions form the foundation of climate resilience. The lack of interdisciplinary approaches indicates the absence of integrative models grounded in SDG interlinkages Lee B. D (2015) or systems thinking (Meadows, 2008; Sterman, 2000) Therefore, future research must develop Integrated Climate–Sustainable Development (ICSD) Models capable of mapping inter-system relationships through transdisciplinary methods.

Second, most studies remain descriptive rather than causal. Nearly all qualitative–descriptive research whether policy analyses (Linn K. M, 2020; Pongsiri & Bassi, 2021), ethnobotanical studies (Darmastuti et al., 2024), or sustainability mapping (Hanifa et al., 2024). Even quantitative studies such as (Sunı et al., 2025) and (Sutanto et al., 2025) rely on cross-sectional designs, which do not allow causal inference. This limits the ability of scientific knowledge to serve as a basis for evidence-informed policy evaluation. Future research must employ stronger methods such as difference-in-differences, quasi-experiments, longitudinal climate-impact evaluations, and system dynamics simulation, especially because climate issues are complex and nonlinear.

Third, there is a significant gap between sustainability education and pro-environmental behavior. (Sari et al., 2025) find that students have relatively high ESD competence but low empathy and environmental action. This is reinforced by (Khaerudin et al., 2025), who show that IoT and big data integration improves knowledge but does not automatically lead to internalization of sustainability values. Conversely, (Mitarlis et al., 2023) show that green chemistry learning improves conceptual understanding but does not measure long-term behavioral change. This gap highlights critiques of the knowledge-deficit model in environmental education. Future research must incorporate behavioral climate science and affective sustainability pedagogy that integrates emotional and cognitive dimensions in climate education.

Fourth, most studies capture only short-term dynamics, even though climate change is multidecadal. Studies such as the GRACE–GLDAS groundwater analysis in Sragen (Hilal et al., 2025) demonstrate the importance of temporal analysis, but remain local and not yet longitudinal. Similarly, energy system studies (Handayani & Filatova, 2023) and national policy research in Myanmar Linn K. M (2020), remain limited to single administrative periods. Long-term studies on resilience trajectories, path dependencies, and multi-decadal climate vulnerability are necessary to understand the cumulative impacts of climate change in Southeast Asia.

Fifth, there is a lack of research on integrating local knowledge with technology, despite recognition of the potential of both. (Negara et al., 2025) and (Astheria et al., 2021) explicitly recommend hybrid models that combine local culture, traditional ecological practices, and modern technological support. Yet no studies have developed empirical frameworks to test this integration. Future research needs to develop hybrid socio-technical–local knowledge systems and legal frameworks for indigenous climate governance, as recommended by (Berkes, 2017)

Sixth, institutional capacity gaps persist in climate policy formulation and implementation. (Handayani & Filatova, 2021) identify misalignments between the NDC and RUPTL. Linn K. M (2020) and (Pongsiri & Bassi, 2021) highlight limitations in governmental capacity to coordinate cross-sectoral policies. (Suni et al., 2025) show that even public acceptance of rainwater harvesting technologies is shaped by socio-institutional capacity. This gap demands research on the political economy of climate transitions and multi-level governance capacity diagnostics that systematically assess the capabilities of local and national institutions.

Seventh, few studies directly examine the alignment between the Paris Agreement and the SDGs. Although several works such as (Handayani & Filatova, 2021) reference the relationship between energy transition and the NDC, no systematic model exists linking NDC contributions to other SDG targets. Research on Paris–SDG Alignment Models, cross-sectoral climate–development reporting, and integrated policy coherence analysis is crucial for the future.

Eighth, the use of spatial data and remote sensing in SDG 13 research remains in its early stages. While (Hilal et al., 2025) use GRACE–GLDAS, the scope remains limited. No studies employ climate digital twins, geospatial AI, or high-resolution machine-learning forecasting to monitor SDG indicators in Southeast Asia. Yet global trends are moving toward large-scale digitalization of climate monitoring. Future research must develop geospatial AI for SDG tracking and climate digital twins for real-time mapping of environmental change.

Thus, these eight research gaps demonstrate that although the Sustainable Development–Climate Action literature in Southeast Asia continues to grow, methodological strengthening, systemic integration, and analytical innovation are urgently needed to bridge the gap between ambition and implementation.

4. Conclusions

A systematic review of twenty-two studies on Sustainable Development (SD) and Climate Action (CA) in Southeast Asia shows that although the two concepts are theoretically understood as a unified systemic entity, empirical research and policy implementation in the region remain fragmented. This fragmentation is evident in the separation of issues such as education, technology, governance, and local knowledge, which are examined in sectoral silos, preventing full conceptual integration between sustainable development and climate action. These findings support the concern raised in the introduction that the growing volume of research does not automatically lead to greater effectiveness in climate action or the advancement of low-carbon development.

A synthesis of findings across studies reveals three main patterns. First, there is strong consistency with global theories such as systems thinking, SDG interlinkages, socio-technical transitions, and governance complexity. This consistency indicates that SD and CA in the region are deeply interconnected and generate cascading impacts that cannot be adequately understood through sectoral approaches. Second, there are empirical contradictions that explain why climate implementation progresses slowly, including gaps between knowledge and behavior in sustainability education, between ambition and implementation in energy policy, between discursive recognition and structural integration of local knowledge, and between technological potential and limited socio-ecological capacity. Third, conceptual debates highlight tensions between technology-driven and community-driven approaches, between the transformative and administrative functions of the SDGs, and between centralized and decentralized governance models in climate policy implementation.

From these findings, eight key research gaps emerge that must be addressed to strengthen SD–CA integration. These gaps include the lack of cross-sectoral integrative approaches, the dominance of descriptive rather than causal research designs, weak links between sustainability education and behavior, the absence of long-term adaptation models, the lack of empirical frameworks that integrate local knowledge and technology, limited institutional capacity, scarce research on the alignment between the Paris Agreement and the SDGs, and restricted use of spatial technologies and AI for climate monitoring.

Overall, this review concludes that Southeast Asia is in the early stages of SD–CA integration. From a theoretical perspective, the direction of integration is clear and supported by thematic consistency in literature. However, from an implementation perspective, the process remains constrained by structural, social, technical, and political factors. Thus, future research requires more transdisciplinary approaches, stronger methodological designs, and more inclusive and adaptive governance frameworks to bridge the gap between sustainable development commitments and climate action in the region.

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