

Original Research

Climate Change in Tuvalu: A Systematic Review of Literature

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ABSTRACT

This systematic review provides a comprehensive overview of research on climate change impacts in Tuvalu, a Pacific island often portrayed as the frontline of climate change. The study analyzes the temporal development, geographical distribution, methodological characteristics, and topics of relevant literature published from 1989 to 2024. A systematic search was conducted using Scopus and Web of Science, yielding 42 studies that met the eligibility criteria. The review finds a significant growth in scholarly attention to climate change in Tuvalu since the late 1990s, with peaks in 2009-2010 and 2015-2016 coinciding with major global climate change events and agreements. The research spans diverse disciplines, with environmental science and geography dominating. Qualitative methods, particularly ethnography and in-depth interviews, are most prevalent, reflecting a focus on understanding local experiences and perceptions. Quantitative methods are employed to analyze physical aspects of climate change, while mixed methods approaches and participatory research are also emerging. Drawing from the synthesis of findings, five key thematic strands emerge: physical and socio-economic vulnerability, migration and displacement, adaptation and resilience, sovereignty and national identity, and global representations and discourse. The review highlights critical gaps, including underrepresentation of Tuvaluan perspectives, limited focus on outer islands, and sparse attention to communication processes.

KEYWORDS

climate change, Tuvalu, Pacific Small Island Developing States (PSIDS), systematic review

Climate change is a global issue that transcends national borders and affects every aspect of our environment, economy, and society. The increasing frequency and severity of extreme weather events, rising sea levels, and shifting climatic patterns are impacting communities worldwide, with both immediate and long-term consequences. This global crisis requires collective action, as no single country can address the multifaceted challenge alone. While the impacts of climate change are universal, certain regions are disproportionately affected,

highlighting the urgent need for tailored strategies to enhance resilience and adaptation.

The Pacific Small Island Developing States (PSIDS), characterized by their limited land area, isolation, and vulnerability to environmental hazards, are often portrayed as the frontline of climate change (Barnett & Waters, 2016; Oakes, 2019). Among these island nations, Tuvalu has become an emblematic case study of the challenges and existential threats posed by climate change. “Tuvalu is sinking.” In May 2021, Simon Kofe, the Minister of Foreign Affairs of Tuvalu, appealed to the reality facing Tuvalu, which is at risk of submersion, stating, “In Tuvalu, we are living the realities of climate change and sea level rise.” Tuvalu is located in the Pacific Ocean, midway between Hawaii and Australia. The island nation of nine low-lying atolls and reef islands. It is one of the smallest countries in the world, covering a total land area of just 26km². The highest point in Tuvalu is only about 4.5 meters above sea level, rendering it extremely vulnerable to rising sea levels (Islam et al., 2023; Lewis, 1989). With its precarious position amidst rising sea levels, more frequent and severe weather events, and the imminent threat of becoming uninhabitable, Tuvalu has garnered significant attention globally (Webb et al., 2023). This attention has not only highlighted Tuvalu’s vulnerability but also the broader implications of climate change on small island developing states.

Amidst the discourses, the concept of “climate refugees” has emerged, framing the residents of Tuvalu as potential victims of global environmental changes, forced to migrate due to circumstances beyond their control (Farbotko, 2005, 2010b). The climate refugees framing has however been contested by the Tuvaluans and people from the PSIDS themselves (Burch, 2021; Farbotko & Lazrus, 2012). These contrasting discourses suggest a complex narrative, where the resilience and agency of these communities are often overlooked. Understanding these differing perspectives is crucial for developing

comprehensive and respectful policies that address both the vulnerabilities and strengths of Tuvalu and other PSIDS.

To examine these issues, this study conducts a systematic review of peer-reviewed literature on climate change in Tuvalu. A systematic review is particularly well-suited for this purpose, as it offers a rigorous and replicable method for synthesizing diverse studies across disciplines, time periods, and methodological approaches (Siddaway et al., 2019). Unlike meta-analyses, which quantitatively aggregate effect sizes, this review employs a qualitative synthesis to identify trends in the literature. This approach enables a comprehensive understanding of how Tuvalu’s climate challenges have been framed, studied, and interpreted in academic research. The review is based on 42 peer-reviewed studies published between 1989 and 2024, identified through Scopus and Web of Science.

Accordingly, this review aims to present an overview of the scholarly landscape concerning climate change in Tuvalu. It examines when and where studies were published, what methodological approaches they used, and what topics they addressed. In addition to mapping current knowledge, the review aims to highlight discursive trends and suggest directions for future research. Ultimately, understanding the evolving representations of Tuvalu within academic discourse contributes not only to regional climate adaptation but also to broader global conversations on climate justice, resilience, and communication.

LITERATURE REVIEW

Climate Change and PSIDS

Climate change is an urgent global crisis with far-reaching environmental, social, and economic consequences. The Intergovernmental Panel on Climate Change (IPCC) has consistently

warned that rising global temperatures, increasing frequency and intensity of extreme weather events, and disruptions to ecological systems pose unprecedented risks to human societies and natural environments (Masson-Delmotte et al., 2021). The effects of climate change are not distributed evenly, with certain regions disproportionately affected. Small island developing states (SIDS) face existential threats from climate-induced changes, including rising sea levels, ocean acidification, and extreme weather patterns. While the causes of climate change are primarily driven by industrialized nations, the consequences are most acutely felt by vulnerable communities with limited resources for adaptation and mitigation (Nurse et al., 2014). The Pacific region, which is home to some of the world's most climate-sensitive nations, has become a focal point in global climate justice debates due to the inequities in responsibility and impact.

PSIDS, comprising nations such as Tuvalu, Kiribati, the Marshall Islands, and the Solomon Islands, are particularly susceptible to climate change due to their geographical and socioeconomic characteristics (Barnett & Waters, 2016). Many of these islands are atolls with elevations of only a few meters above sea level, making them highly vulnerable to coastal erosion, storm surges, and saltwater intrusion into freshwater supplies. As sea levels rise are projected to increase by up to one meter by 2100, these nations face the prospect of land loss, displacement, and potential statelessness (Oppenheimer et al., 2019). The livelihoods of many PSIDS communities depend on climate-sensitive sectors such as agriculture, fisheries, and tourism, all of which are being disrupted by shifting weather patterns and deteriorating marine ecosystems.

Climate-related disasters, such as cyclones and prolonged droughts, frequently damage critical infrastructure, reduce agricultural productivity, and disrupt local markets, making economic

recovery an ongoing challenge (Pelling & Uitto, 2001). Tourism, a major economic sector for many Pacific islands, is particularly at risk as extreme weather events and environmental degradation deter visitors and erode natural attractions (Becken, 2005). These structural economic vulnerabilities highlight the disproportionate burden that climate change places on small island economies. Despite their vulnerabilities, PSIDS have demonstrated resilience through both traditional knowledge systems and international climate diplomacy. Pacific Islanders have historically adapted to environmental challenges through mobility, resource-sharing, and sustainable land-use practices, highlighting the importance of indigenous knowledge in climate adaptation strategies (Campbell, 2009).

However, contemporary climate challenges require external support in the form of climate finance, capacity-building, and technological transfer. International mechanisms such as the Green Climate Fund and the Loss and Damage agenda under the United Nations Framework Convention on Climate Change (UNFCCC) have sought to address these needs, yet financial disbursements remain slow and insufficient compared to the scale of the crisis (Roberts & Pelling, 2018). Pacific leaders have played a crucial role in global climate negotiations, advocating for stronger mitigation commitments and the recognition of climate-induced displacement as a critical issue (Barnett & Campbell, 2010). Nevertheless, without immediate and sustained action to reduce global emissions, adaptation alone will not be sufficient to safeguard the future of PSIDS. The case of PSIDS illustrates the profound injustice of climate change, wherein nations that contribute the least to greenhouse gas emissions bear the greatest burden of its consequences.

Tuvalu

The challenges faced by Pacific Small Island Developing States (PSIDS) in the face of climate change are perhaps most acutely exemplified by Tuvalu. As a low-lying island state, Tuvalu is among the most vulnerable countries to rising sea levels, coastal erosion, and extreme weather events. Scientific projections indicate that if global sea levels continue to rise at their current rate, Tuvalu could face severe land loss, freshwater contamination, and eventual displacement of its population (Aung et al., 2009). While the international media often portrays Tuvalu as a nation on the brink of disappearance, the reality is more complex, shaped by a combination of environmental, political, and socio-economic factors (Connell, 2003).

Tuvalu has gained international attention as the quintessential example of climate vulnerability due to its geographic characteristics and political activism in climate diplomacy. As an atoll nation with an average elevation of just 1–2 meters above sea level, Tuvalu's very existence is threatened by rising tides and increased flooding (Connell, 2003). Unlike larger island nations that have mountainous terrain or inland areas to retreat to, Tuvalu's small, low-lying atolls leave no room for internal displacement (Yamano et al., 2007). The increasing frequency of king tides, which cause saltwater intrusion into freshwater supplies and agricultural land, has further reinforced the perception of Tuvalu as a climate crisis hotspot (Farbotko, 2005).

Beyond its physical vulnerability, Tuvalu has also played a prominent role in climate change advocacy. Since the early 2000s, Tuvalu has positioned itself as a leading voice in international climate negotiations, particularly within the United Nations Framework Convention on Climate Change (UNFCCC). The country's leaders have consistently pushed for stronger global commitments to emissions reductions, highlighting Tuvalu as a frontline victim of climate

inaction (Farbotko, 2005). Tuvalu was among the first nations to call for limiting global temperature rise to 1.5°C above pre-industrial levels, a target that was later enshrined in the Paris Agreement following pressure from the Alliance of Small Island States (AOSIS) (Locke, 2009). This diplomatic engagement has amplified Tuvalu's visibility, making it a symbolic representation of the existential risks faced by small island nations.

Tuvalu consists of nine low-lying atolls and reef islands spread over approximately 26 square kilometers, making it one of the smallest sovereign states in the world. Despite its limited land area, Tuvalu's Exclusive Economic Zone (EEZ) covers nearly 900,000 square kilometers of ocean, underscoring its reliance on marine resources (Paton, 2009). The small size of its economy, combined with geographic isolation and limited natural resources, makes it highly vulnerable to external shocks, including those caused by climate change. One of the most pressing concerns for Tuvalu is the impact of sea-level rise.

Historical reconstructions of Tuvalu's topography indicate that the country's landmass is naturally dynamic, with periodic flooding becoming more severe due to anthropogenic climate change. Recent measurements suggest that Tuvalu's sea level has been rising at approximately 5.9 mm per year, a rate significantly higher than the global average of 1–2 mm per year (Aung et al., 2009). The increasing frequency of king tides and storm surges has exacerbated coastal erosion and saltwater intrusion, leading to loss of arable land and freshwater sources, which in turn impacts food security and public health (Yamano et al., 2007).

Climate change also threatens Tuvalu's sovereignty and national identity. As rising seas encroach on the islands, there are growing concerns about the displacement of entire communities and the potential loss of Tuvalu as a nation-state. In response, Tuvalu's government has engaged in diplomatic efforts to secure international recognition of its sovereignty,

regardless of physical land loss (Stratford, 2013). Migration has been a widely discussed adaptation strategy for Tuvaluans, yet the reality is more nuanced. While international narratives frequently describe Tuvaluans as “climate refugees,” migration is often driven by economic and social factors rather than immediate climate threats (Mortreux & Barnett, 2009; Shen & Gemenne, 2011). Many Tuvaluans prefer to remain on their islands, despite climate-related risks, due to strong cultural attachments and limited resettlement options. However, mass relocation remains a politically and socially contentious issue, as it raises questions about national identity and the rights of displaced populations.

International responses to Tuvalu’s plight have been mixed. While Tuvalu has been active in global climate negotiations, advocating for stronger emissions reductions and adaptation funding, tangible support remains limited, forcing Tuvalu to rely on external aid and local resilience measures (Farbotko, 2005; Locke, 2009). However, as sea levels continue to rise, the long-term viability of Tuvalu remains uncertain. As climate change accelerates, the case of Tuvalu will certainly serve as a crucial test for global climate governance, equity in adaptation funding, and the resilience of island communities.

To build upon this background, the purpose of this study is to systematically examine the scholarly landscape concerning climate change and Tuvalu, with particular attention to how the country is represented, framed, and discussed in academic literature. A systematic literature review (SLR) is particularly suited for this task, as it allows for comprehensive mapping of research trends, themes, and methodological approaches across a wide range of studies over time (Siddaway et al., 2019). Unlike meta-analyses, which quantitatively synthesize effect sizes from empirical studies, this review adopts a qualitative synthesis approach aimed at identifying discursive patterns, thematic clusters, and conceptual gaps in the literature. In doing so, the review offers both a descriptive

and analytical account of how Tuvalu’s climate crisis has been studied and represented, situating the findings within broader discussions of Pacific climate politics and communication. The following research questions guide this review:

RQ1. What are the temporal, spatial, and methodological characteristics of the studies on climate change and Tuvalu?

RQ2. What are the discursive trends in the literature on climate change and Tuvalu?

METHOD

Eligibility Criteria

The units of analysis included in the review are scientific journal articles focusing on Tuvalu, climate change, and its impact. Literature published in the English language until 2024 was included in the selection so the development of the research on climate change in Tuvalu could be examined. Exclusion criteria encompassed non-peer reviewed papers, gray literature and studies that were not published in English. In addition, studies on climate change and Tuvalu that pertain to other sectors, such as legislation or nutrition, were also excluded.

Data Sources

Searches for relevant articles were conducted on Scopus ($n = 170$) and Web of Science ($n = 338$). These databases are repositories of multi-disciplinary peer-reviewed resources, hence credible and reliable (Muthuri et al., 2020; Schäfer & Schlichting, 2014). Moreover, their search tools enabled a systematic identification of articles based on the eligibility criteria.

Search Strategy

The search operation terms used were “Tuvalu”

AND “climate change” OR “climate refuges” OR “climate migration” in the title, abstract, and keywords filter. The search was limited to publications in the English until 2024, as per the eligibility criteria. The corresponding filters were added respectively on Scopus and Web of Science.

Data Extraction

Zotero, a reference management software, was then used to export the BibTex citations of all the search returns and to remove duplicates ($n = 88$). The remaining literature ($n = 420$) was screened individually, and irrelevant publications ($n = 230$) were withdrawn. Irrelevant publications include articles that do not focus on Tuvalu AND climate change despite mentioning it in the title, abstract, or keywords. The results of the systematic selection process are illustrated in a flow diagram adapted from Page et al. (2021) (see Fig. 1). Metadata of the publications included in the final sample ($N = 42$) were extracted using a code sheet by Schäfer & Schlichting (2014) and adapting it to the current systematic review.

Extracted information were as follows: title of the study, author(s), affiliation(s), year of publication, name of the publication, goals, methodology, and keywords.

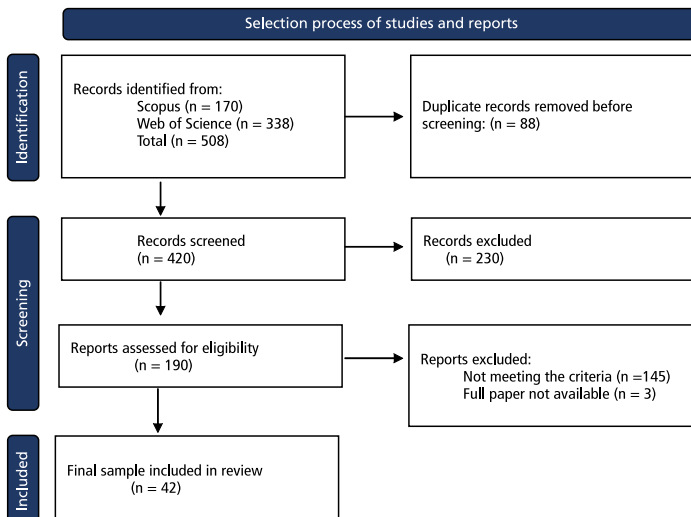
RESULTS

What are the Temporal, Spatial, and Methodological Characteristics of the Studies on Climate Change and Tuvalu?

Temporal Characteristics

The studies on climate change in Tuvalu examined in this review span over three decades, from 1989 to 2024. A look at the quantitative development of the research field indicates a significant growth in scholarly attention to climate change in Tuvalu (Figure 2). Research activity began modestly in the late 1990s and early 2000s, with only a handful of studies published each year. The earliest study by Lewis, 1989, examined the physical implications of sea level rise for Tuvalu, setting the stage for future research (Aung et al., 2009;

Figure 1. Flow Diagram for Data Collection



Connell, 2003; Farbotko, 2010b; Mimura, 1999). Researchers considered the global temperature increase to be related to sea level rise, which led to practical investigations focusing on island nations in the South Pacific.

The number of publications remained relatively low and stable until the late 2000s, where we observe a marked rise in research output. Notably, in 2009 and 2010, the number of studies peaked significantly, with up to five publications per year, reflecting a growing global recognition of climate change issues during this period (Bedford & Bedford, 2010; Farbotko & McGregor, 2010). This surge in publications coincides with Tuvalu's emergence as a symbol of climate vulnerability, often portrayed as a "canary in the coal mine" for climate impacts (Farbotko, 2010a). Although erratic, growth is also visible when the trends beyond the initial surge in the late 2000s are examined.

After a slight dip in the early 2010s, research activity saw another increase around 2015 and 2016, which corresponds with major international climate agreements such as the Paris Agreement in 2015. The core content of the 2015 Paris Agreement is to limit the increase in the global average temperature to well below 2 degrees Celsius above pre-industrial levels, with efforts to restrict it to 1.5 degrees, and to involve all countries in climate change response efforts starting from 2020. Reflecting this trend, there

was a surge in scholarly research during this period, driven by active global policy discussions and commitments to address climate change. Scholarly attention seemed to have focused on vulnerability and migration during that time (Farbotko et al., 2016; Marino & Lazrus, 2015; McCubbin et al., 2015; Smith & McNamara, 2015). The subsequent years maintained a steady flow of publications each year, though not reaching the peaks seen in 2009 and 2010.

The most recent studies, published between 2020-2023, show a trend towards more nuanced approaches that challenge simplistic narratives. For instance, Farbotko (2023)'s study on mobilities and immobilities in Tuvalu during the COVID-19 pandemic provides a more complex picture of Tuvaluan resilience and adaptation. This evolution reflects a growing recognition of the multifaceted nature of climate change impacts and the importance of local perspectives, moving beyond the initial focus on physical impacts to encompass social, cultural, and emotional dimensions of climate change and mobility in Tuvalu.

Spatial Characteristics

The spatial characteristics refers to the country base of the authors' institutions and the disciplines where climate change in Tuvalu has been studied, as reflected in the journals and reports. To determine this, the frequency of each country

Figure 2. *Timeline of the Development of the Research on Climate Change in Tuvalu*

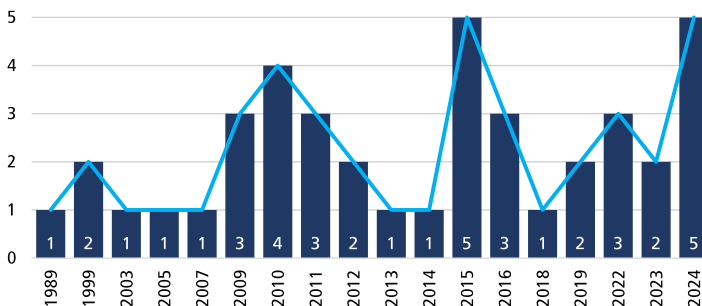
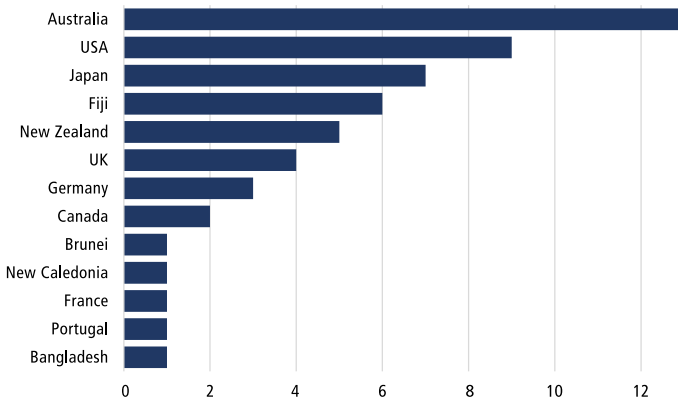


Figure 3. *Country Base of the Researchers' Institutions*

was counted, ensuring that if multiple authors were from the same institution, the country was only counted once. The analysis revealed that the majority of studies were conducted by researchers based in Australia, Japan, and the United States, highlighting a strong focus on the Pacific region.

The majority of studies on climate change in Tuvalu have been conducted by researchers affiliated with institutions in Australia, as well as Fiji and New Zealand, when considering country-level affiliations rather than specific institutions. This reflects both geographical proximity and the geopolitical relationships between these countries and Pacific Island nations. These countries are all members of the Pacific Islands Forum, working together to promote political and economic stability. Australia and Tuvalu have established a climate migration agreement, the Falepili Union, which allows for the permanent migration of Tuvaluans to Australia (Barnett et al., 2024; Kitara et al., 2024). New Zealand also provides immigration pathways for Tuvaluan citizens through the Pacific Access Category Resident Visa. Researchers from institutions in the United States, Japan, United Kingdom, and Canada have also made significant contributions to the literature. European countries such as Germany,

France, and Portugal are also represented, though to a lesser extent. This wide geographic distribution of contributors reflects growing global academic interest in Tuvalu, driven by its status as both a highly vulnerable small island state and an active participant in international climate negotiations. Notably, some studies involve collaborations between researchers from multiple countries, including partnerships with Pacific regional organizations. However, Tuvaluan scholars remain significantly underrepresented in lead authorship roles.

The disciplines covered in these studies are diverse, as evidenced by the variety of journals in which they were published. These include geography, environmental science, social sciences, and interdisciplinary fields. Environmental Science and Geography dominate the research field. Journals range from those focused on specific regions like the “Island Studies Journal” to broader environmental publications like “Global Environmental Change.” This multidisciplinary approach reflects the complex nature of climate change impacts on Tuvalu, encompassing environmental, social, economic, and policy dimensions. This diversity underscores the necessity of a comprehensive and multifaceted

Table 1. *Fields that Have Studied Climate Change in Tuvalu*

Field of study (name of journal)	F	%
Environmental Science - Geography Australian Geographer; Asia Pacific Viewpoint; Singapore Journal of Tropical Geography; The Geographical Journal; Global and Planetary Change; Geografiska Annaler, Series B: Human Geography; Climate Research; WIT Transactions on Ecology and the Environment; Regional Environmental Change; Environment, Development and Sustainability; Climate Policy; Chain Reaction; Environmental Economics and Policy Studies; Environment Systems and Decisions; Earth's Future; Transactions of the Institute of British Geographers; Wiley Interdisciplinary Reviews – Climate Change	19	45.2%
Social Sciences – Geography Global Environmental Change; Global Change, Peace & Security; International Migration; Progress in Disaster Science; Journal of Ethnic and Migration Studies; Island Studies Journal; CESifo Economic Studies; International Journal of Tourism Research; Climate and Development; Social and Cultural Geography; International Politics, Local Environment; Applied Mobilities	15	35.7%
Social Sciences Pacific Studies; Transcultural Psychiatry; Faculty of Science, Medicine and Health -Papers	3	7.1%
Social Sciences - Anthropology Human Organization	2	4.8%
Communication / International Relations International Journal of Communication; International Affairs	2	4.8%
Multidisciplinary American Journal of Applied Sciences	1	2.4%

Note: N = 42, F = frequency

understanding of the challenges faced by Tuvalu in the context of climate change. However, one notable point is that it is difficult to find research in the field of communication. While Farbotko (2005) and Constable (2016) have examined media representations of Tuvalu, they do not explicitly engage with communication theories or frameworks. Given the media's powerful role in shaping public understanding and political discourse around climate change, this absence is significant. To foster more informed and impactful international dialogue on issues concerning Tuvalu, there is a pressing need for scholarship that draws from communication studies.

Methodological Characteristics

The studies on climate change in Tuvalu employ a diverse range of research methods, reflecting the multidisciplinary nature of the topic and the complexity of the issues involved. Qualitative methods feature prominently in many studies.

Ethnographic approaches are particularly common, with researchers conducting extensive fieldwork in Tuvalu. This often involves long-term participant observation, where researchers immerse themselves in local communities to gain deep insights into daily life and cultural practices. In-depth interviews are frequently used, allowing researchers to explore local perceptions, experiences, and responses to climate change in detail. For example, Gibson et al. (2019) conducted semi-structured interviews with key informants and lay residents of Funafuti atoll to understand idioms of distress related to climate change.

While less common, quantitative methods are still significant, particularly in studies focusing on the physical aspects of climate change. These include analysis of sea level data, often using long-term datasets to identify trends. Climate modeling is employed to project future scenarios for Tuvalu under different climate change conditions. GIS

Table 2. *Methods Used in the Studies About Climate Change in Tuvalu*

Method	F	%
Predominantly qualitative	25	59.5%
Quantitative and qualitative combined	9	21.4%
Predominantly quantitative	8	19.1%

applications are utilized for visualizing and analyzing environmental changes over time. For instance, Yamano et al. (2007) used data spanning 108 years to reconstruct changes in topography, land use, population, and building distribution at Fongafale Islet.

A handful of studies combine qualitative and quantitative approaches, using mixed methods to provide a more comprehensive understanding of climate change impacts and adaptation strategies. This integration allows researchers to contextualize quantitative data with qualitative insights and vice versa. For example, McCubbin et al. (2015) used a vulnerability framework that incorporated both quantitative indicators and qualitative data from semi-structured interviews to assess climate change impacts in Funafuti.

Content analysis is another common method, with researchers examining policy documents, media reports, and historical records. This approach is particularly useful for tracing changes in discourse and policy over time. Farbotko (2005), for instance, analyzed news articles from the Sydney Morning Herald to explore representations of Tuvalu in climate change discourses. Case study approaches are also employed, with some researchers focusing intensively on Tuvalu or comparing it with other Pacific Island nations. This method allows for in-depth exploration of specific contexts and enables comparative analysis. Beyerl et al. (2019) used this approach to compare perceptions of climate-related environmental changes in Tuvalu, Samoa, and Tonga.

Participatory research methods are increasingly evident, engaging local communities in the research process. These methods aim to

incorporate traditional knowledge into scientific studies and ensure that research outcomes are relevant and beneficial to local populations. The study by Lazrus (2015) on risk perception and climate adaptation in Tuvalu exemplifies this approach, combining cultural theory with an examination of traditional environmental knowledge. This distribution of methods reflects the multidisciplinary nature of climate change research in Tuvalu, with a strong emphasis on understanding local contexts, experiences, and perceptions through qualitative approaches, while also incorporating quantitative data to measure and project physical changes.

What are the Discursive Trends in the Literature on Climate Change and Tuvalu?

Research on climate change and Tuvalu has evolved significantly over the past three decades, reflecting shifts in global climate discourse and deepening interdisciplinary engagement. From early environmental assessments to contemporary analyses of sovereignty and resilience, this literature maps not only Tuvalu's physical risks but also its complex socio-political landscape.

Initial studies from the late 1980s to early 2000s focused on Tuvalu's biophysical vulnerability to sea-level rise, coastal erosion, and saltwater intrusion. Foundational works like Lewis (1989) and Mimura (1999) drew attention to Tuvalu's unique geographic exposure as a low-lying atoll nation, forming the basis for early adaptation frameworks. Yamano et al. (2007) introduced GIS-based analyses to quantify coastal changes and highlight land loss trajectories. These studies often treated Tuvalu as a passive victim

of climate change, setting the tone for early alarmist narratives. Recent advancements in hazard modeling, such as Wandres et al. (2024), confirm that over 25% of Tuvalu's landmass is at risk of coastal inundation, reinforcing the need for updated national-scale risk assessments.

This period also emphasized climate-induced hazard risks, infrastructure fragility, and economic disruption, especially in agriculture and water access. As sea-level rise and storm surges became recurring concerns, vulnerability remained a persistent theme, even as later studies sought to challenge its one-dimensional portrayal.

From the mid-2000s onward, literature began engaging more deeply with mobility and displacement, framing Tuvalu as a potential source of "climate refugees." Farbotko and Lazrus (2012) notably critiqued the deterministic language of forced migration, arguing that the label of "climate refugee" obscures Tuvaluan agency, identity, and attachment to land. Connell (1999) and Mortreux and Barnett (2009) similarly highlighted how migration decisions are complex, shaped by cultural values and economic factors rather than solely environmental pressures. Kitara et al. (2024) built on these narratives by introducing the *fale pili* concept to reframe mobility justice through Indigenous values, while Barnett et al. (2024) discussed the *Falepili Union* as a form of climate-informed regional cooperation.

Recent studies such as Islam et al. (2023) and Farbotko (2023b) explore compound crises, like the overlap between climate change and COVID-19, to understand both migration and immobility. These works point to new migration typologies, such as circular migration, planned relocation, and migration-as-adaptation, challenging simplistic narratives of exodus.

Several studies address recurring discourses that shape international perceptions of Tuvalu. Tourism has emerged as both a risk and a potential adaptation strategy. Pridaux and McNamara (2013) and Islam et al. (2023) explored how

Tuvalu's climate vulnerability is marketed as a "last chance tourism" destination, while others like Farbotko (2010a) critique this as voyeuristic and commodifying.

Global media representations frequently cast Tuvalu as a "disappearing paradise," which may raise awareness but also strip the community of agency. Farbotko (2005, 2010b), Saddington (2024), and Fisher (2011) critique this spectacle narrative, emphasizing the need for more grounded portrayals of Tuvaluan perspectives and experiences.

A newer body of literature also examines Tuvalu's strategic use of digital infrastructure and representation in the face of existential threats. Hegde (2024) discusses sociotechnical transitions in Tuvalu's approach to digital sovereignty and climate diplomacy, while Rothe et al. (2024) explore the implications of "Digital Tuvalu" as a post-territorial state.

Across these themes, the literature reflects a gradual shift from viewing Tuvalu as a passive site of climate tragedy to recognizing it as a strategic, culturally resilient, and diplomatically active nation. Environmental vulnerability remains a foundational concern, but it is now entwined with nuanced explorations of mobility, governance, identity, and representation. These discursive trends suggest that the case of Tuvalu is not only central to Pacific climate studies but should be emblematic of global debates around climate justice, sovereignty, and resilience.

CONCLUSION

This systematic review has synthesized the scholarly literature on climate change and Tuvalu, analyzing 42 studies published between 1989 and 2024. The review reveals how research on Tuvalu has evolved from early environmental assessments centered on sea-level rise and coastal vulnerability to more recent interdisciplinary engagements with migration, sovereignty, resilience, and cultural

identity. These shifting discursive trends reflect a broader reconfiguration of Tuvalu in global climate scholarship—from a passive symbol of climate crisis to an active agent of adaptation, diplomacy, and discursive innovation.

Temporally, research output has grown in tandem with global climate negotiations, particularly following major summits such as Copenhagen and Paris. Spatially, the literature is dominated by scholars based in Australia, Japan, and the United States, with limited leadership from Tuvaluan researchers—highlighting a critical gap in epistemic inclusivity. Methodologically, the studies employ diverse approaches, including ethnography, GIS modeling, policy analysis, and participatory research, underscoring the multifaceted nature of climate impacts and responses in Tuvalu.

Thematically, five major strands recur across the literature: (1) vulnerability, (2) migration and displacement, (3) adaptation and resilience, (4) sovereignty and national identity, and (5) global representations and recurring discourses. Recent contributions have begun to explore post-territorial imaginaries, such as digital sovereignty, highlighting Tuvalu's innovative role in shaping new climate futures. Vulnerability has been a consistent global concern, especially in the context of small island developing states (SIDS). The framing of climate-induced migration has sparked significant debate, paralleling discussions about agency and mobility in global forums. Adaptation and resilience have gained traction internationally as core principles of climate action, with growing attention to community-based and traditional knowledge. Furthermore, the discourse around sovereignty and national identity in Tuvalu aligns with broader global questions around deterritorialization, post-national governance, and cultural preservation in the face of environmental threats. In short, the thematic priorities in Tuvalu's climate literature echo global discursive trends.

However, this review is not without limitations.

The study focused only on English-language, peer-reviewed publications, potentially excluding important perspectives from regional grey literature and non-academic sources. Tuvaluan scholars remain significantly underrepresented. The variation in methodological rigor and reporting across studies limited comparative analysis, and while thematic categorization provided structure, some themes overlapped or defied neat classification. Furthermore, publication patterns were influenced by global political moments, which may obscure continuous community-based efforts or non-climate-specific structural challenges.

Despite these limitations, this review offers critical insight into how Tuvalu has been conceptualized and studied within climate change literature. It underscores the need for more locally led and participatory approaches in future research—ones that not only document vulnerability but also center Tuvaluan voices, strategies, and visions. Beyond documenting the thematic evolution of climate change research in Tuvalu, this review also identifies an underdeveloped strand of scholarship: the role of communication processes, media representations, and discourse in shaping both global perceptions and local responses. While some studies have interrogated how Tuvalu is framed in international media as a “disappearing paradise,” the broader field of climate communication remains sparsely addressed. There is a need for more communication-focused research that examines how narratives of vulnerability, resilience, and adaptation are constructed, circulated, and contested—across news media, international policy forums, and local storytelling. Future studies could draw on environmental communication, risk perception, and media framing theories to deepen understanding of how climate change is socially constructed in the Tuvaluan context. Exploring indigenous climate narratives, participatory communication strategies, and

the communicative dimensions of migration decisions could enrich the literature and offer valuable insights for both communication scholars and practitioners.

Climate change is intensifying globally. It is anticipated that the climate change will not only destroy environmental ecosystems and worsen socioeconomic crises but also significantly impact human civilization. In this context, this study, which systematically reviews research related to Tuvalu, a symbol of climate change, holds great significance. It is hoped that this study will help spark discussions on what the world should do to ensure the safety of the planet and the survival of humanity in this era of climate change.

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