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Climate change and migration from atolls? No evidence yet

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People living on low-lying coral atolls are highly exposed to climate change and there is much discussion that climate change is and will increasingly force their migration. This article presents findings from a systematic literature review on climate-change migration in atolls. We found an implicit (if not explicit) assumption in the literature that migration driven by climate change is already happening, yet the literature shows no empirical evidence of this to date. The prevailing assumption that outmigration is the only option has meant there is little consideration of local adaptation options in the literature, with little attention to how people living in these places may want to adapt, nor scrutiny of the enabling policies and institutions necessary for them to secure their futures.

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Introduction

Much of the academic literature assumes that climate change will undermine the habitability of atolls such that relocation of their populations is inevitable, either in response to hardships or as a first-resort solution to avoid them [10,12,13,16,17,20,31,34,36,41,42,45,48,52,54–57,7]. Atolls are a particular focus of climate change migration narratives due to their geomorphological characteristics — these are small low-lying places that are particularly exposed to sea-level rise, and which must also contend with other climate change risks to coral reefs, health, fisheries, freshwater systems, and infrastructure [40]. The claim that large-scale outmigration will occur in atolls is based on assessments of risks rather than evidence of migration patterns.

Admittedly, the influence of climate change on migration patterns is difficult to identify, making evidence difficult to establish. Individual decisions to migrate or not to migrate are highly complex, involving multiple pressures and assessments at any given time. Environmental migration studies demonstrate the inherent difficulties in determining environmental drivers of migration among other signals. For example, surveys of subsistence communities known to be facing extreme environmental pressures have been found to attribute outmigration to economic decline rather than environmental impacts as their livelihoods are intimately linked with environmental change [4,14,28,33]. Tracking a climate change signal is even more fraught, given there is the added challenge of attributing environmental impacts to climate change (though attribution is becoming less of an issue as climate change impacts amplify). The lack of reliable data also limits detecting climate signals in migration patterns. There is no global population database, national censuses seldom ask sufficient questions to understand drivers of migration, and household registration systems where they exist do not tend to capture migration reasons such that collecting meaningful evidence on the reasons behind migration is expensive, time-consuming, and methodologically challenging [25,33]. Where quantitative research allows for measuring population movements, the multi-causality of migration makes understanding mobility patterns challenging, given the multiplicity of existing and anticipated social, political, economic, and environmental drivers [39].

These challenges aside, there are ways to empirically unpack the influence of climate change on migration. There have been a couple of recent systematic reviews of climate migration research finding a range of methods that can meaningfully disentangle the range of drivers shaping migration decisions [15,44]. For example, household survey methods tailored to a specific case study can examine environmental stressors alongside individual perceptions of climate variability and the political economy of migrant-sending areas and receiving areas, in ways that pure spatial analyses fall short

(examples include [4,53]). Qualitative field studies can offer deep insight into the multicausality of migration, identifying perceptions of risk, social norms, and narratives of vulnerability alongside political economy analyses (e.g. [30,38]). These contributions highlight the need for nuanced approaches that consider broader mobility patterns, including historical ones, when assessing migration in the context of climate change. The path-dependent nature of migration suggests that future migration patterns will to some extent follow past ones. Thus, in the context of atolls, factors such as internal mobility and short-term or cyclical migration for employment and education opportunities have always been fundamental tools in the island adaptation toolkit [11,49] and are likely to remain so.

Because of this, migration and adaptation studies need to pay attention to multidirectional movement, rather than assuming migration is permanent and unidirectional [14]. This also points to the importance of sociocultural and psychological variables when looking at migration patterns, such as place attachment, the role of kinship networks, and the importance that identity and a sense of belonging have in determining population movements [1,2,51]. Researchers have developed methods to bring out these subjective, cultural, and context-specific processes that shape islanders' experiences of mobility, uncovering drivers that go beyond environmental determinants [43]. These approaches are particularly effective in the context of atoll communities where there is a strong pattern of migration historically, and where the small population sizes mean that surveys can quite quickly achieve representation, and qualitative research can capture migration intentions with significant social, economic, cultural, and environmental depth and breadth.

Thus, even though it is difficult to untangle all the drivers and quantify the weight each one of them has in individual decisions to migrate, it is possible to some extent to identify whether climate change influences migration patterns. Moreover, it is critical that we use empirical evidence to support any claims of outmigration due to climate change. This is particularly important in the case of atoll communities where many scholars seem to have skipped the attempt to identify a climate signal and instead assume that existing migration is, at least in part, driven by climate change. This is highly problematic as it suggests that people from atolls communities have little confidence in adapting to climate change and this can lead to less adaptation investment. Indeed, Marino and Lazrus found that foreign investment in rainwater tanks in Tuvalu has been difficult to establish due to investor perceptions of Tuvalu's climate vulnerability, despite a strong appetite for adaptation locally [30]. This perception of climate vulnerability in Tuvalu, as with other atolls, has been heavily shaped and reinforced by speculative climate migration discourses [18,19]. The aim of this review is to therefore examine the evidence for outmigration from atolls due to climate change. By challenging the assumption that large-scale outmigration from coral atolls is already occurring because of climate change, this paper hopes to reassert the importance of evidence in defining adaptation priorities.

Methods

Systematic literature reviews are useful to understand the state of knowledge in a given field, and to demonstrate gaps or biases to improve future research agendas [21]. With respect to climate change and migration, three recent systematic reviews examine the state of knowledge on mobility related to climate change. Ghosh et al. [22] recently published a bibliometric analysis on climate change and migration in the Pacific. Their study, while not providing a content analysis, demonstrates the extensive attention that islands in the Pacific are receiving from scholars interested in examining the link between climate change and migration [22]. Focussing on slow-onset climate change impacts worldwide, Zickgraf uses a systematic literature review to examine the evidence that climate change is driving mobility, and while the paper does not shed much light on mobility in the Pacific, it does find that most papers are geographically focused on 'Asia' (including the Pacific), and on Fiji and Bangladesh in particular [58]. De Sherbinin et al. [15] provide an overview of how migration theory is used in empirical studies of mobility related to climate change, suggesting that scholars tend to overlook many of the key tenets of mobility theory, though they do not analyze the geographic focus of these studies [15].

Our systematic literature review targeted peer-reviewed papers that examined communities living on coral atolls with a focus on climate change mobility and adaptation. To identify these papers, searches were conducted using the Scopus database in October 2021 and refreshed again in March 2022. The search was limited to peer-reviewed articles in the final stage of publication, published after the year 2000, and in the English language. The following search terms were used within the title, abstract, and/or keywords (see Table 1). Our geographic interest is specifically on studies that focus on atolls such that papers that used other commonly used terms such as 'small island developing states' or 'Pacific Island Countries' or 'South Pacific' were not included. Papers for example that use the key term 'Fiji' have not been included, noting that there are empirically informed papers on climate change and migration in Fiji [58–60].

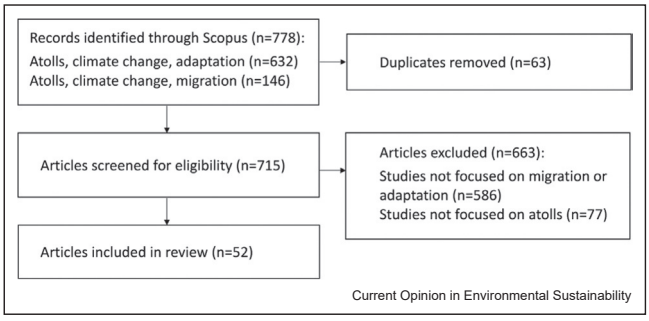
Following this approach, 778 studies were identified. We then screened these papers by reading titles and abstracts and limiting the sample for review to studies with a focus on human migration and/or adaptation, and

Table 1

Boolean search terms used for systematic review.

Climate change	climate OR greenhouse OR warming OR drought OR flood OR erosion OR inundation OR cyclone OR disaster OR 'sea level rise' OR storm OR hazard
Atolls	atoll* OR reef AND island* OR Kiribati OR Maldives OR 'Marshall Islands' OR Tokelau OR Tuvalu
Mobility	migrat* OR mobilit* OR resettle* OR refugee* OR relocat*
Adaptation	adapt* OR resilien* OR coping OR transform* OR adjust*

Figure 1



Flowchart demonstrating identification and screening of reviewed articles.

studies focussed on inhabited atolls. This process led to 52 papers being selected for in-depth analysis (refer to Figure 1 for the selection process as per PRISMA guidelines for systematic literature reviews). The large number of papers excluded is due to their exclusive focus on biophysical systems, with no discussion of social systems. For example, there were many studies focussing on the migration of bird species and the adaptation of coral reefs to thermal stress. These had nothing to do with the migration or adaptation of human populations.

The selected 52 papers were analyzed based on discipline, methods, geographic focus, thematic focus, and their conceptualization of migration and adaptation. This included an assessment of the extent to which migration papers considered different types of mobility (whether short term/cyclical/permanent, forced/voluntary, and internal/external) and the extent to which statements about migration were consistent with and referred to theories from migration studies. For adaptation, the analysis focused on the scale of activity (e.g. household, island, and nation) and the type of adaptation considered (e.g. livelihood transition, capacity building, and infrastructure development), and the extent to which *in situ* barriers and enablers were considered.

The 52 papers came from a range of disciplines, including geography (17), law (6), development studies (4), economics (3), environmental science (2), and political science (2), among others. The atolls they focussed on were predominantly countries comprised entirely of atolls: Kiribati (19), Tuvalu (18), Maldives (13), Republic of the Marshall Islands (8), with a lesser focus on the Solomon Islands (3), Papua New Guinea (2), and the Torres Strait Islands (1). Interestingly, 43 of the 52 selected papers came up in both the migration and adaptation searches, demonstrating how closely intertwined adaptation and migration discussions are within the literature.

Migration and the empirical divide

Analysis of the selected papers revealed an empirical divide in the literature. There were 30 empirical papers: 18 applied purely qualitative methods (mostly interview methods with local residents and key informants such as government officials), seven applied purely quantitative methods (all household survey data, only one based on secondary census data), and seven applied mixed methods (mostly observation and/or focus groups alongside interview and/or survey data). As demonstrated in Table 2, these 30 empirical papers tended to take a nuanced view of the role of migration in response to climate change. Empirical papers were far more likely to situate the discussion within the migration literature and with reference to theories of migration, consider a range of mobility pathways (not just permanent external migration), provide an analysis or discussion of non-climate drivers of migration, and to consider local experiences and perspectives.

In contrast, papers that were not empirically founded (instead presenting a literature review, discussion, or commentary) were more likely to frame migration as a signal of climate danger with a focus on migration that is permanent, forced, and external. In these non-empirical papers, migration is positioned as an inevitable response to climate change, if not the only option considered for atoll communities (e.g. [23,29,56]). A few of these papers use population numbers as an estimate for displaced people and uncritically use alarmist language such as 'climate refugee'. Albeit less common in recent years, this still occurs in the literature. Mostly absent from these commentaries are discussions about how people living in these places may want to adapt and how they envisage their own futures.

In terms of their impact on the field, the empirical papers that take a more nuanced understanding of mobility

Table 2

Extent to which various forms of migration (or mobilities) are considered within empirical and non-empirical papers.

	Empirical (30 papers)	Nonempirical (22 papers)	Total (52 papers)
Situates within migration literature/theory	18 (60%)	6 (27%)	24 (46%)
Considers voluntary migration	23 (76%)	7 (31%)	30 (57%)
Considers short term/cyclical migration	13 (43%)	6 (27%)	19 (36%)
Considers internal migration	14 (46%)	6 (27%)	20 (38%)
Considers nonclimate drivers	23 (76%)	10 (45%)	33 (63%)
Considers outer islands	12 (40%)	2 (9%)	14 (27%)
Considers local perspectives/experiences	19 (63%)	6 (27%)	25 (48%)
Considers those left behind	9 (30%)	6 (27%)	15 (29%)

appear to have slightly more influence, cited 31 times on average, as opposed to 24 citations on average for the non-empirical papers. It is concerning that some of the non-empirical papers with a simplified approach to migration — essentially hypothesizing about atoll peoples' futures — still have significant traction with other scholars.

No evidence that climate change is a driver of migration (yet)

The link between climate change and migration from atoll communities is not yet evident in the academic literature. Where empirical evidence has been collected about mobility, the drivers of decisions to migrate are so diverse that it is difficult to derive a clear climate signal. Climate change is hard to distinguish from other environmental issues such as natural disasters and hazards, coastal, and land degradation or waste management problems, all of which can influence the decisions made by people to migrate or stay [30,9]. Historically, the dominant drivers for migration from atoll communities have been the search for work and better access to education and healthcare services and currently there is no evidence in the literature to suggest other factors driving migration from these places.

Although as many as 19 articles hypothesize that climate change will displace significant numbers of atoll populations, none present evidence to support these assertions. This is not to say that climate change-driven migration is not occurring or that it will not occur, but quite simply that the data do not yet provide conclusive evidence. For example, in their study in the Marshall Islands, van der Geest et al. [53] show that existing migration is multicausal and driven mostly by the desire to access education, healthcare, work, and family rather than environmental factors. Their findings also suggest that atoll islanders living abroad are more likely to consider environmental drivers than people living on-island, which points to the effects information and science communication (more conspicuous in the USA than in the RMI) has on people's perceptions and decision-making (see Refs. [5,46,47]). This latter point was also made by Kothari [26], who shows how the Maldivian government mobilizes scientific discourses to its own advantage, emphasizing the potential future impacts of climate change to promote inter-island relocation despite locals foregoing the relocation options they are offered. Kelman et al. [24] likewise find that migration in the Maldives is mostly internal and motivated by desires to access improved services and living conditions. Where research participants discussed climate change as a potential driver for migration, this was in all cases hypothetical, where individuals said they would consider migration following amplification of climate change impacts.

Likewise, Mortreux and Barnett's study in Funafuti [38] provides evidence that despite the high number of Tuvaluans living abroad, climate change is not a driver of large-scale migration, and highlights the desire of islanders to live at home to preserve their cultural values, lifestyle, and identity. A similar approach has been found elsewhere in the Pacific. In Kiribati, Allgood and McNamara [7] show that people are not responsive to the government's attempts to promote international migration, and instead that their attachment to the land and values is an incentive to adapt in place. In the Maldives, Speelman and colleague's analysis [50] posits an intention to migrate that is at odds with the reality of internal migration for education, employment, and healthcare.

The evidence for migration as adaptation

Atolls are precarious environments that require exacting livelihood skills to sustain populations. They are sensitive to environmental perturbations such as droughts, cyclones, and flooding. This, though, does not signal their vulnerability as much as it has stimulated the development of adaptive capacity [35]. Traditionally, inter-island mobility has been among the systemic strategies deployed by islanders to persist in atolls [37,9]. The literature attests to the continuation of this adaptation strategy, with 23 articles acknowledging that, in principle, migration can be a type of adaptation to climate change.

For example, a study by Birk and Rasmussen [8] in the Solomon Islands' atolls proves that economically motivated

internal migration reduces vulnerability by enhancing access to remittances. Their empirical data show that there is a high degree of mobility from outer atolls to urban areas and that this movement is (potentially) a good adaptation strategy. Oakes [43] highlights the importance of land for atoll dwellers and how place attachment trumps relocation in migration decisions, making the oft-ignored point that remaining populations are not necessarily 'trapped' but 'immobile' due to place attachment, which in turns draws attention to the great need for research and resources to support *in situ* adaptation.

Conclusion

This paper has presented findings from a systematic review of the literature to examine the evidence for climate-induced migration from atolls. It has found that relatively few studies collect data on mobility to substantiate claims of climate-induced migration. There is an implicit (if not explicit) assumption that migration driven by climate change is already happening, yet the literature does not provide evidence of this. The literature on migration clearly posits that migration decisions are driven by multiple factors, so it is not surprising that there is no clear climate signal in the studies reviewed. In the absence of evidence of a climate signal on migration, it is concerning that migration dominates discussions about adaptation in atolls with little investigation into *in situ* adaptation options and disregard for the autonomy, agency, and rights of atoll people. The papers most likely to promote the climate relocation narrative are those with no empirical evidence.

Despite a lack of evidence of climate-change-induced migration, it remains important to plan and provide support for people living on atolls to continue living there and to support people's decisions to migrate. We accept that slow- and fast-onset climate impacts may quite suddenly affect migration or displacement and that social and political systems need to be prepared ([3,27]). To fill gaps in the state of knowledge about climate change and migration in atolls, future research should seek to be empirical, and focus on *in situ* adaptation options (focussing on what works, what could work, what enables adaptation, and the effect of diverse forms of migration on adaptation); internal migration (focussing on the extent of internal migration, drivers of decisions, the benefit and costs to migrants and to their communities of origin, and what would help people to stay or to move); and external migration (focussing on how can countries of origin and destination best support migrants and maximize their contributions to those they leave behind).

Data Availability

No empirical data were used for the research described in the article.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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This empirical study examines how i-Kiribati is responding to climate change impacts. It finds that respondents are highly concerned about the impact climate change would have on their livelihoods, with many building physical defences and seeking government assistance. The paper mentions a community that has relocated internally but does not provide detail to understand the extent and nature of this movement. The focus is on how residents would like to have the option of external migration in the event that *in-situ* adaptation was no longer feasible in Kiribati.

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