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Local perceptions of climate change impacts and migration patterns in Malé, Maldives

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For the last few decades, Maldives has been seen as being at the forefront of addressing climate change impacts. The low elevation of the islands makes them vulnerable to slow-onset hazards, such as coastal erosion, sea-level rise, salinity intrusion, and change in monsoon patterns and hence rainfall. Consequently, migration has long been discussed as an adaptation strategy for the population. This study covers outcomes from our field research conducted among islanders in Malé, the capital of Maldives, in 2013. It contributes empirical evidence toward understanding complex relations among environmental challenges, climate change, and migration. We set up two main research questions. The first question explored islanders' perceptions of impacts of climatic variability in recent years and possible impacts of future climate change. The second question probed whether out-migration from the islands might be considered to be an adaptation strategy and whether the islanders were willing to move outside Maldives due to projected climate change impacts. We conducted our field research in the capital Malé and nearby residential islands, using quantitative questionnaires with local respondents (N=347). Our results suggest that, besides a set of actually experienced environmental and climate challenges, slow-onset climate change impacts such as sea-level rise are perceived as being one of the key factors affecting Maldivian society and livelihoods. More than 50% of respondents perceive future sea-level rise to be a serious challenge at the national level and they accept that migration from islands to other countries might be a potential option. Conversely, from the individual perspective, sea-level rise is not perceived by the local population as being one of their own important challenges. The reason is that many other factors – cultural, religious, economic and social – play an important role in decisionmaking about migrating or not.

KEY WORDS: Maldives, climate change impacts, migration, risk management, islanders, quantitative survey

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Introduction

For over 25 years, the low-lying archipelago of Maldives in the Indian Ocean has been recognised as sitting at the forefront of being vulnerable to and addressing climate change impacts, notably coastal erosion, sea-level rise, salinity intrusion, and changes in monsoon patterns leading to floods and droughts (Fulu 2007; Ghina 2003; IOM 2015; Kothari 2014; Sathiendrakumar 1996; Shaig 2006; World Bank 2010). The country was the site of the *Small States Conference on Sea Level Rise* which ran from 14 to 18 November 1989, ending with the *Malé Declaration on Global Warming and Sea Level Rise*. In the run-up to this meeting, UNEP had launched the Ocean and Coastal Areas Programme Activity Centre (OCA/PAC) to assess potential impacts of climate change and to assist national governments in identifying and implementing sustainable policy options and adaptation measures.

Maldives received special attention as an in-depth case study, with Pernetta and Sestini (1989) identifying several key environmental issues, including climate change risks. Since then, these problems and attention to them have been intensifying (Alexander and Mercer 2012; Arnall and Kothari 2015; Baldacchino and Kelman 2014; Fulu 2007; Ghina 2003; Kothari 2014; MHAHE 2001; Sathiendrakumar 1996; Shaig 2006). In particular, the islands display unstable morphology shown by the islands' sizes, shapes, elevations, and positions on reef platforms changing over time (Fulu 2007; Ghina 2003; MEEW 2007; Shaig 2006). According to IPCC (2013–14), sea-level rise projections are 0.3–1.0 m globally by 2100 over a range of emission scenarios. Such sea-level rise would significantly damage Maldives' economy, particularly the tourism and fishing sectors on which it relies; e.g. the direct contribution of the travel and tourism sector to GDP in 2013 was 48% which rises to 95% when indirect effects such as supply chains are considered (WTTC 2014).

Yet island countries – not just Maldives, but many others examined in the literature – display vulnerability to challenges including climate change impacts, and also ways of dealing with those impacts (e.g. Gaillard 2007; Lewis 1999; Lewis 2009; Spillius 1957). In implementing adaptation measures, human migration is frequently viewed as a potential strategy, particularly in the context of other factors such as development aid and remittances (Felli and Castree 2012; Foresight 2011; King and Connell 1999; Lewis 1999). In-country migration and resettlement schemes have been common trends over the last several decades in many small islands in the Pacific and Indian Oceans (Bedford and Hugo 2012; Mimura *et al*. 2007).

In fact, islanders have always migrated for livelihood, social, environmental, security, and other reasons (Bedford and Hugo 2012; Kelman *et al*. 2015; King and Connell 1999). There has always been a diversity of migration typologies; for instance, for a compilation of environmental migration typologies, see Stojanov *et al*. (2014). As the relationship between climate change and migration receives increasing attention (Black *et al*. 2011a; Felli and Castree 2012; Foresight 2011; Myers 1993; Piguet 2008), it is becoming clearer that one single factor is rarely a sufficient reason for migrating. Migration causes are usually multi-faceted, with climate change adding to already increasing levels and complexities of population mobility (de Sherbinin *et al*. 2011; Felli and Castree 2012; Foresight 2011; Hugo 2011).

In order to understand the scope and impact of climate change on mobility choices, empirical studies examining motivations for migration have been increasing, aiming to disaggregate the factors and to provide empirical evidence regarding migrants' perceptions and explanations for their migration choices. Examples are those focusing on migration within and from drought-affected areas (Henry *et al*. 2004; Rain 1999); migration-related interests in the context of projected sea-level rise from small island communities (Kelman 2015; Kothari 2014); and migration responses to floods and storms (De Sherbinin et al., 2011; McLeman and Hunter 2010). Often, terms such as 'climate refugees' or 'climate change refugees' are used, but neither phrase fits robustly into a scientific framework and they have been criticised as being inadequate, politically motivated, and artificially constructed (Bettini 2013; Hartmann 2010; Kelman 2015; Nicholson 2014). Moreover, some authors point out that hazards related to climate change affecting islands are being emphasised too much, so that climate change distracts from other development issues (Kelman 2014).

Consequently, views on migration as adaptation differ. Some authors (Alscher 2011; Black *et al*. 2011b; Foresight 2011; Martin *et al*. 2014; McLeman and Smit 2006) accept this concept as a typical, local strategy to deal with climate change. Others (Bettini 2014; Felli and Castree 2012; Kelman 2015; Kelman *et al*. 2015) explore wider implications for people affected by climate change as well as uncritical assumptions of 'climate migration' and of 'migration as adaptation'. Banerjee *et al*. (2014) suggest that displacement of entire communities occurs as a last resort once all other adaptation possibilities have been exhausted. Foresight (2011) postulated that facilitating migration because of environmental change might broaden the opportunities and maximise the benefits from the migration process. The narrative of migration as an adaptation strategy has many parallels with the migration and development nexus and the debate

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over the conditions during which migration may provide a route out of poverty (Banerjee *et al*. 2014).

Much of this debate takes place within the academic literature at a conceptual level. Fewer studies examine perspectives and perceptions of those who have to, or who are expected to, make migration-related choices. This study examines local perceptions of environmental challenges facing Maldivians in terms of projected climate change impacts with migration as a potential adaptation strategy.

The next section briefly describes Maldives' environment and geography, followed by a section describing potential adaptation strategies for Maldives, including migration as a possibility. Then, the core of this study is presented, being empirical research with quantitative analysis of local perceptions of environmental change, including adaptation measures with particular attention devoted to migration. The final section provides wider reflections and conclusions.

Environment and geography of Maldives

Maldives (Figure 1) comprises an archipelago of 1190 islands just south of India, grouped into 26 low-lying coral atolls. Around 200 islands are permanently inhabited and 80 more are used as tourist resorts. The land area totals only 298 km^2, with no island larger than 10 km^2. Over 80% of the country sits less than 1 m above sea level (MEEW 2007; Pernetta and Sestini 1989; Republic of Maldives 2010; World Bank 2007). In Maldives, about 10% of the land is occupied by agricultural/cultivated land, 3% by forested land, 3% by pastures (MEE 2011). The soil is thin and of poor quality, being a maximum of about 20 cm deep and not too fertile, while often containing rock and sand. It is alkaline due to an excess of calcium from coral rock and sand.

Maldives has a tropical climate, with the air temperature generally varying from 23 to 31°C and an annual mean temperature of 28°C. The weather is dominated by the two monsoon periods, the SW monsoon from May to November and the NE monsoon from January to March. Average annual precipitation varies regionally and increases from north to south, with the northern atolls receiving on average pf approximately 1700 mm/year and the southern atolls receiving on average of approximately 2350 mm/year (Bailey *et al*. 2015). Precipitation has great inter-annual variability, although the wettest months tend to be May, August, September, and December, with the driest being January to April; overall humidity ranges from 75% to 83% (MEEW 2007; Pernetta and Sestini 1989).

A few islands have small lakes, but the main freshwater resource is in thin freshwater lenses underneath the land. These freshwater lenses are often heavily depleted and contaminated, as in the capital city of Malé, and much freshwater was salinised during the 2004 tsunami. Maldives can no longer rely on these freshwater lenses to satisfy their freshwater needs, due to increasing demands from population growth, more saltwater intrusion, increasing demand per capita including from tourism, and rising pollution of groundwater from sewage, industrial effluent, and poor agricultural practices (Bailey *et al*. 2015; Basu and Shaw 2013; Ibrahim *et al*. 2002).

Until the 1970s, Maldives' economy was rather isolated and was based on fishing, shipping, and coconut cultivation. It changed after the advent of tourism, which has been stimulating new economic activities and investment. The economy remains focused on tourism and fishing, meaning that together with low agricultural production, it is highly dependent on imports of goods and services, with the economy exhibiting large fluctuations. For example, while the economy grew by 19.6% in 2006, it dropped 3.6% in 2009 due to the world financial crisis and hence reduced tourist numbers. But in 2010, it increased by 7.1%. Then in 2013, economic growth was 3.7% (World Bank 2014). Recently, the Government of Maldives has been striving to develop new economic sectors, such as off-port shipping services, information technology and financial services in order to reduce Maldives' current reliance on tourism (World Bank 2014).

The country is also burdened by its high level of central government debt. While at the beginning of the century, the ratio of debt to GDP remained quite stable at 40% of GDP, after 2008, it grew rapidly and in 2011 was 73.5% of GDP (World Bank 2015). Recently, the World Bank (2014) classed Maldives as at 'high risk' of debt distress because in 2014 the debt was around 86% of GDP and debt dynamics are projected to deteriorate further.

To sum up, Maldives exemplifies the challenges and opportunities facing small island states under environmental change (Alexander and Mercer 2012; Dolman 1985; Hay 2013; Julca and Paddison 2010; Kelman 2014; Lewis 1999). The distribution of the population across many islands burdens the public budget for infrastructure, transport, health care, social services, and education while providing advantages for tourism, culture, and quality of life. These baseline characteristics remain as climate change increasingly affects the country.

Climate change and adaptation in Maldives

Adaptation strategies

Adaptation is defined as 'the process of adjustment to actual or expected climate and its effects' (IPCC 2013–14, glossary, 1) and is applied to Maldives in the *Strategic National Action Plan for Disaster Risk*

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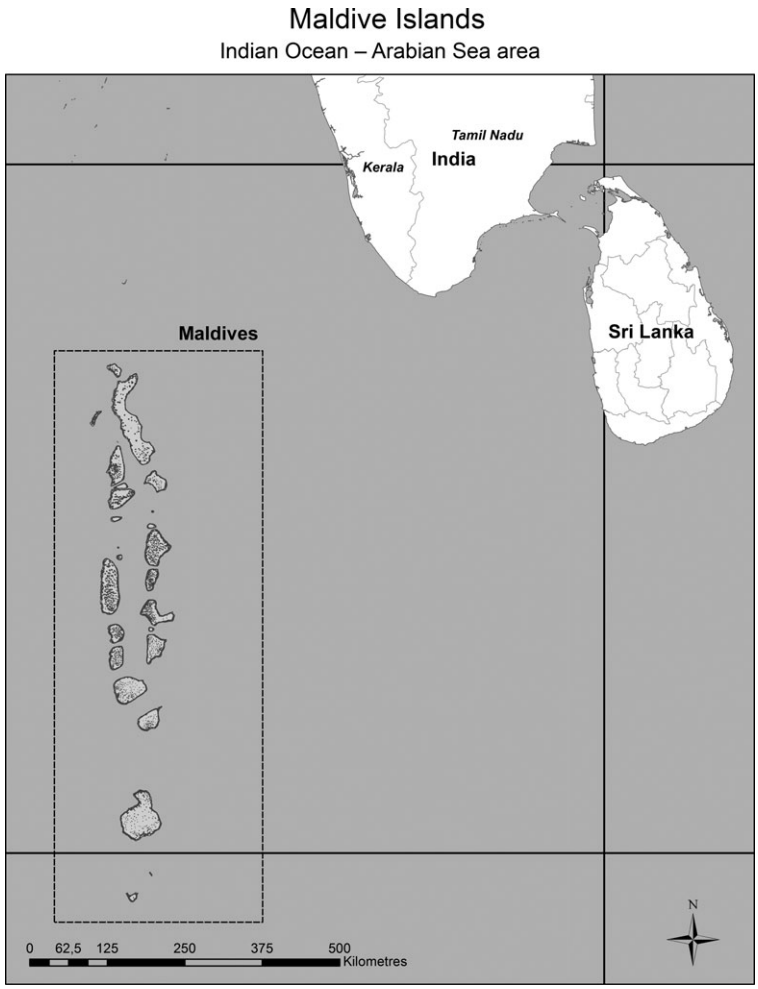

Figure 1 Maldives

Reduction and Climate Change Adaptation (SNAP) which aims to empower four strategic areas from 2010 to 2020 for climate change risk (Republic of Maldives 2010):

1 an enabling environment towards good governance;
2 empowered and capable communities;
3 communities with access to technology, knowledge, other resources; and
4 risk-sensitive regional and local development.

As shown in Table 1 for the coasts, hard and soft adaptation measures are often distinguished. Soft measures tend to be smaller-scale, less capital-intensive approaches, including ecosystem-based adaptation such as planting mangroves and protecting coastal vegetation, compared with hard measures which tend to be coastal engineering and building structures such as sea walls (Sovacool 2012).

But which measures are best suited to offer a sustainable future for Maldives? Sovacool (2012) suggests that the heterogeneity and diversity of Maldives means that a single solution does not exist. The main dilemma is cost, in terms of who will pay for the necessary measures, including community consultations to ensure that the people's ideas, views and expertise are incorporated. Alexander and Mercer (2012) examine a community-based approach to ensure that options and decisions are thoroughly investigated and that the community has a strong say in the decision-making process and ultimate outcome. The presumption is that donors external to Maldives would need to fund the work, leading to power asymmetries between Maldivians deciding what they

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Table 1 Examples of hard and soft adaptation measures for coasts

Climate change impact	Hard measure	Soft measure
Sea-level rise	Construction of sea walls and tetra pods	Mangrove afforestation and beach nourishment
Water scarcity	Desalinisation of water	Capturing rainwater
Saltwater intrusion	Elevated water tanks and storage systems	Thickening coastal vegetation
Tidal inundation	Land reclamation	Dune replenishment
Community relocation	Construction of artificial or designer islands	Coral propagation and protection around existing islands

Source: Adapted from Sovacool (2012)

want and non-Maldivian donors potentially having their own preferences.

So far, at the national level, several programmes and projects have been pursued, with SNAP (Republic of Maldives 2010) mentioned above. The *National Adaptation Program for Action* (MEEW 2007) also set up several key areas of climate change impacts to be addressed. The first area deals with environmental issues such as land loss, beach erosion, threats to coral reef biodiversity and threats to freshwater and rainwater. The second area covers threats to infrastructure such as critical infrastructure, settlements and tourist resorts. The third area relates to agriculture, water availability and food security. These key areas are interconnected. For example, threats to freshwater sources influence agriculture, water availability, food security and human health. Adaptation approaches must be long term and connected to each other, covering environmental, economic and social issues.

Maldives also has its *Safer Island Strategy* and *Safer Island Development Program*; the term 'safe islands' refers to Maldives' larger islands which will theoretically be adapted to climate change through reclamation and other, mainly hard, measures so that people can migrate there (Islam *et al*. 2011). Concerns about this adaptation measure include the impacts on the local environment, especially biodiversity, and the sensitivity of relocation as a topic, especially the voluntariness of moving. In 2010, another project called *Integration of Climate Change Risks into the Maldives Safer Island Development Programme* reflected transitions to and changes of adaptation frameworks, focusing on soft adaptation strategies, such as empowering local communities, using natural vegetation, and decentralising decision-making (Elrick-Barr *et al*. 2015; GEF 2009; Sovacool 2012).

Sovacool (2012) argues that future climate change threats and some economic and development motivations may be among the strongest drivers for preferring hard solutions, especially relocating people to the new artificial islands (called 'designer islands'). Hulhumalé is the most visible example. This island is set to be inhabited by 100 000 new inhabitants by 2030. Another example is Dhuvaafaru in Raa Atoll, which was re-settled in 2009 by residents from Kandolhudhoo which was destroyed by the 2004 tsunami (Sovacool 2012).

Settlements and infrastructure have no choice but to be located on low-lying land near the shoreline, because that is all the country has. Thus, they are affected by impacts exacerbated by sea-level rise, including inundation, beach erosion, storm surges, and high waves. According to Shaig (2006), more than 42% of the population and 47% of all housing structures are within 100 m of the coastline. Localised human activities contribute to the challenges, with specific problems including high population and housing densities, poor infrastructure and devastation of beach vegetation. Several responses have been implemented, starting with individual voluntary migration and resettlement projects (which increased after the 2004 tsunami destroyed several Maldivian communities, e.g. Pardasani 2006), and land reclamation. The largest reclamation project (Shaig 2006) is Hulhumalé, a 100% reclaimed island approximately 1.89 km^2 in area. Other examples of partially reclaimed islands are Malé (0.82 km^2, 41% of the current land area is reclaimed), Maamigili (0.8 km^2, 51% of the current land area is reclaimed), and Hulhulé which has the international airport (0.76 km^2, 58% of the current land area is reclaimed).

Land reclamation as an example of a large-scale adaptation measure may exacerbate problems and contribute to environmental harm. Sovacool (2012), Pernetta and Sestini (1989), and Pernetta (1992) mention coastal dredging for construction of harbours and surrounding infrastructure such as protecting wall, breakwaters and jetties. Creating an artificial environment can potentially contribute to the destruction of surrounding coral reefs, burying original lagoons and interrupting sediment movements. Another adaptation option remains, that of out-migration, which is further developed in the following section.

Out-migration as adaptation?

Besides land reclamation as an adaptation option or staying, out-migration as an adaptation option for

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leaving is discussed. Some authors point out positive consequences of migration related to climate changes. Birk and Rasmussen (2014), Black *et al*. (2011b), and Tacoli (2009) discuss livelihood diversification, environmental pressures easing at home, and opportunities increasing for income availability – all of which support climate change adaptation. McLeman and Smit (2006) consider human migration as a reasonable response to environmental risk exposure, such as climate change. According to King *et al*. (2014), relocation is a strategy available to some as part of an extensive range of responses to extreme weather, but unsupported resettlement is not always an option for reasons such as family commitment, livelihood opportunities and financial constraints.

In fact, while many islanders have always used migration as a livelihoods and adaptation strategy, some typically undertake migration as a last resort when all other possibilities have been exhausted (Bedford and Hugo 2012; King *et al*. 2014; King and Connell 1999). Farbotko (2005) indicates for Tuvalu that non-migration adaptation strategies are more significant for island peoples faced with climate change than relocation and mitigation initiatives in the future. Notwithstanding the cases where communities have been forced to move due to climate change only, Kelman *et al*. (2015) point out that climate change does not immediately or substantively change mobility and non-mobility choices of many living in low-lying island communities.

Arnall and Kothari (2015) revealed some discrepancies among Maldivian attitudes to links between climate change and migration. They showed that many Maldivians, called 'non-elites' (ordinary people) by the authors, did not see sea-level rise as being a sufficient reason to migrate. Conversely, elites were more concerned. Arnall and Kothari (2015) also noted that older interviewees preferred to stay where they were, but were also relatively open to the prospect of relocating, provided that the national government covered the costs of resettlement in full. In contrast, many younger interviewees viewed migration induced by climate change as a potential opportunity to secure a better life elsewhere.

Meanwhile, Kumar (2014) does not consider migration from Indian Ocean islands as a solution to natural resource shortages and overpopulation. He applies the same judgement to planned relocation of whole communities elsewhere on purchased land. He argues that relocated inhabitants would not have electoral rights and would lose their culture and language, while potentially contributing to religious conflicts.

Within this context, is migration as adaptation suitable for Maldivians? For the moment, the situation is not urgent because migration as adaptation may emerge from slow environmental degradation linked to climate change, but it could nonetheless change any day due to extreme weather or other sudden changes (Kelman 2015). Additionally, not all the islanders depend entirely on environmental resources directly, because of the large volume of imports (including bottled water) and the tourism-based livelihoods. Migration as adaptation is possible, but not necessarily essential for Maldivians, although it is important to consider whether or not internal migration should or could suffice for long-term adaptation.

Methodology

This study focuses on Maldivian perspectives on climate change impacts and migration patterns, examining links (or lack of links) between the two phenomena. The two main questions investigated are:

1 How do local residents perceive the current and potential future impacts of climate change?
2 How might migration be considered or not considered as a potential climate change adaptation strategy?

The respondent sample is taken from the capital city, the island of Malé, and the nearby residential islands of Villingili and Hulhumalé (Figure 2). No assumption is made that these results are generalisable beyond Maldives, particularly given the cultural diversity of other island countries which might experience similar climate change impacts to those in Maldives, especially the consequences of sea-level rise. Instead, by focusing on Maldives here, we follow the call by Upadhyay *et al*. (2015) for contextualisation when investigating climate change and migration links. By selecting a specified geographic area for a particular study, this call has been met by the many others studies of islands, climate change and migration, including for the Marshall Islands (Rudiak-Gould 2013) and Tuvalu (Shen and Gemenne 2011).

Our questionnaires focused on respondents' perceptions of environmental threats, climate change, livelihood conditions, and migration intentions and patterns using quantitative closed questions. Four main question clusters were used:

1 household and demographic characteristics;
2 current living conditions;
3 perceptions of socio-economic and environmental changes; and
4 migration patterns, tendencies, and perceptions of migration due to future sea-level rise impacts.

We completed 347 questionnaires from August to November 2013 via face-to-face interviews. The researcher asked a household member on the street or in any public space to participate and the researcher completed the questionnaire with the respondent. This method ensured the possibilities of explaining those questions which were not clear to

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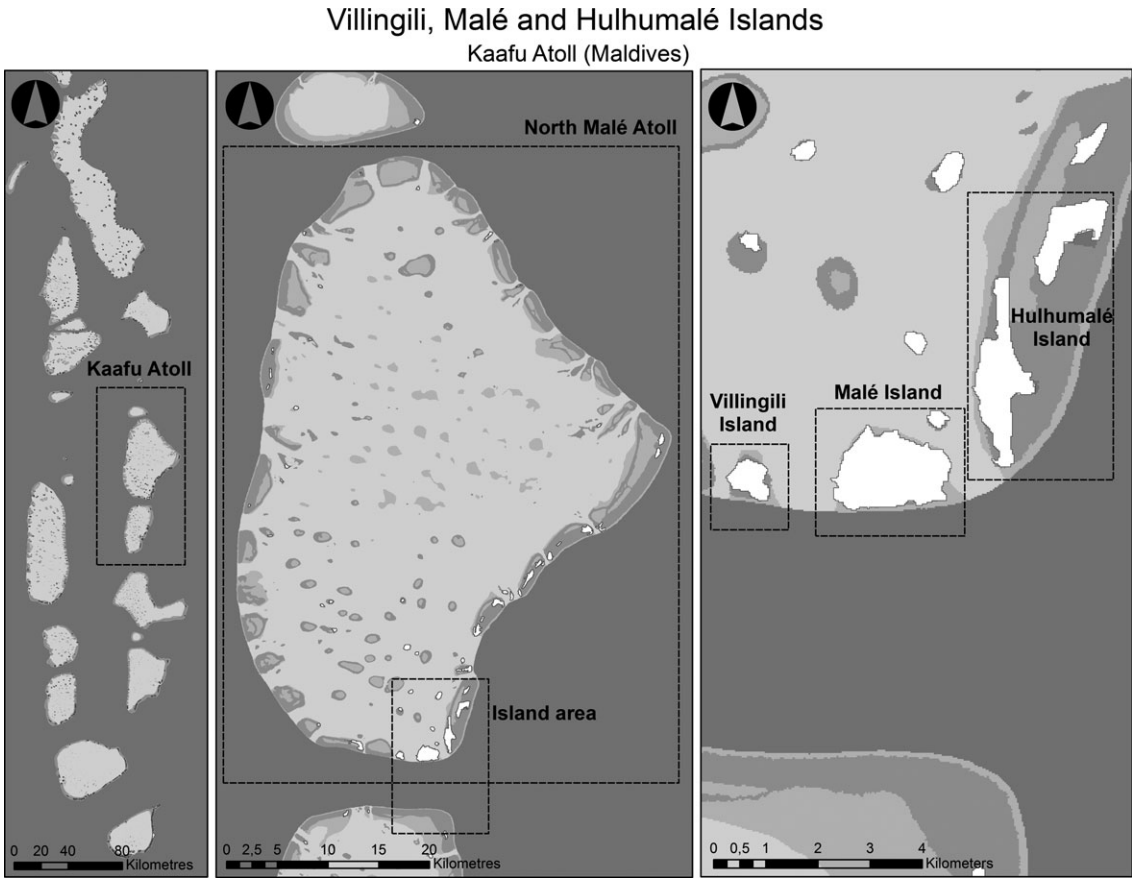

Figure 2 North Malé Atoll and detail of Malé, Villingili, Hulhumalé islands

respondents, and obtaining additional responses, personal opinions, and other pertinent information related to each specific response. The respondents were guaranteed anonymity and confidentiality.

For selecting respondents, we aimed for as wide a range of age, education and employment as possible, but only respondents aged 18 years or older. Because of the geographical focus of the survey, the sample is not representative of the population of Maldives as a whole. We report standard logit models (logistic regression) for statistical analysis (Cameron and Trivedi 2005).

Findings and discussion

Perceptions and understandings of environmental change impacts

The questionnaire investigated respondents' experience with extreme weather conditions and their ways of dealing with these, and their experiences of any changes in weather patterns. This section addresses these perceptions of weather and climate for all respondents.

More than 60% of all respondents had experienced extreme natural hazards in the past, the majority of them referring to the 2004 tsunami, while recognising that the tsunami was not linked to climate change. To deal with such experiences, of the respondents who had experienced extreme natural hazards, almost 17% mentioned house reconstruction and 13% mentioned migration. Other structural measures (e.g. sea walls and drainage systems) were mentioned by 11% of respondents. More than 40% of respondents did not suggest any measures. The rest of the respondents mentioned other approaches including government subsidies and international aid. While not implying that climate change causes or would cause tsunamis, the respondents tended to assume that climate change impacts would be similar to their tsunami experience.

In the context of climate variability and weather changes, 71% of respondents had observed some shifts and changes in weather patterns within the

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past 10–15 years. Just 8% had not observed any changes, while the remainder had not noticed. From the entire sample of respondents, 53% perceived summer monsoons to be hotter today and 31% perceived them to be coming sooner. Meanwhile, winter monsoons were hotter (48%) with less rain (38%). From the 247 respondents who observed some changes in weather within the previous 10–15 years, 31% were members of a household in which at least one person had a university degree, 24% came from households including at least one person with a college diploma, and 15% came from households with only secondary school education.

Table 2 shows that 37% of all respondents worried about environmental challenges, such as lack of space for living and population growth (18%), climate variability or dry weather and water shortages (9%), and impacts of sea-level rise and soil erosion (7%). The perception of other future challenges such as job availability (10%), higher crime rates (4%), political instability and conflicts (5%), and low quality of healthcare and education (4%) were not considered to be as serious as environmental concerns.

This outcome is likely to be due to the high awareness and political priority of environmental topics, as well as the strong international perception of Maldives as being highly impacted by climate change-to the degree that Maldives has become an icon for these impacts. Nevertheless, the environmental concerns highlighted have direct impact on day-to-day lives, whereas the other topics do not necessarily, to the same level. For example, water shortages and coastal erosion are environmental concerns that directly impact day-to-day life on small islands. Lack of space due to the high population density cannot be escaped, so it is a frequent topic of discussion in the streets and at higher political levels.

Table 2 Respondents' perceptions of challenges

Challenges	Relative frequency (%)
Not able to specify any challenges	10.09
Environmental change	37.18
sea-level rise and soil erosion	*7.20*
lack of space and population growth	*17.87*
dry weather and water shortage	*3.75*
climate variability	*5.48*
pollution of environment	*2.88*
Job availability	10.37
Higher crime rates	3.75
Political instability, conflicts	4.61
Low quality of health care and education	4.03
Others	29.97

Meanwhile, Maldives has suffered from political instability for several years leading to street violence and arrests for treason. Yet rates of petty crime and day-to-day criminal acts are low. Additionally, some violations of human rights such as domestic, sexual and gender-based violence, while fluctuating substantially in recent years (Fulu 2014), might not always be assumed to be a crime in Maldivian (or many Western) societies, whether or not the law forbids them. Consequently, crime rates may not be seen as a major concern, in line with respondents' views. The low rates of concern for political instability and health/education quality are surprising, but the location of the interviews might account for this result. Those living in Malé have access to the best health care and education in the country, so locally, this topic might be of less concern. Similarly, while national politics is highly contentious in the country and is always a topic for discussions in the street, its impact on day-to-day life is less than some of the other concerns raised.

Migration patterns: descriptive analyses

From the perspective of respondents who have already been internal migrants, improved education, livelihoods and living conditions are the decisive factors for migrating, mentioned by 44% of respondents who moved from other islands to Malé. Just 2% of these respondents suggested poor environmental conditions or natural hazards. Socio-economic factors dominate internal migration decisions.

Forty-nine percent of respondents plan to move abroad, migrating either temporarily or permanently. The main reasons are seeking improved health care, education and living conditions (26%) followed by family reasons, nationality and religion (20%). Environmental reasons – specifically sea-level rise and soil erosion, climate variability, overpopulation and lack of living space – were mentioned by 13% of respondents. Prevailing factors motivating the respondents to move away remain socio-economic. On the other hand, environmental factors play a more important role in respondents' decision-making to leave Maldives compared with internal migration to Malé.

Just 10% of respondents from households with university degrees mentioned these environmental reasons, while 13% with college diplomas and 14% with only secondary education mentioned environmental reasons. Nobody mentioned dry weather or water shortages as a possible reason for migrating. Household education level appears to make little difference to views of environmental reasons for migrating.

Little academic literature exists on internal migration within Maldives. One of the most detailed studies (Sathiendrakumar and Tisdell 1987) is also rather outdated, being published before climate

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change had such a large political influence and highlighting livelihood reasons as the principal factor for internal migration. Kothari (2014) provides an historical account of central government policies regarding internal migration in Maldives. For decades, the government has been trying to consolidate the population from outer islands to a small number of islands on which larger communities would be built. Originally, the government's reason for population consolidation was given as economic sustainability and provision of social services. Now, the government's reason for population consolidation is given as climate change. Consequently, the top-down discourse for internal migration has been changing, but so far, the consolidation policy has not been implemented. In terms of the wider literature on islander mobility (e.g. Baldacchino 2007; Guan and McElroy 2012; Kelman *et al*. 2015; King and Connell 1999), internal migration – primarily from outer islands or rural areas to the capital – is common, with the main reasons being better education, livelihoods and living conditions, exactly as for Maldives. The data here provide new insights from Maldives, matching well with previous studies on islander mobility.

Respondents mentioned various preferred destinations and regions for migrating. We defined clusters to evaluate the main destination regions, differentiated geographically and economically. Cluster 1 consists of more economically developed countries, but rather distant from Maldives, such as the European Union and the USA. Cluster 2 comprises Asian countries located comparatively close geographically and culturally to Maldives, mainly India, Sri Lanka, Malaysia and Indonesia. Cluster 3 consists of two more economically developed countries, Australia and New Zealand. Cluster 4 indicates internal migration within Maldives.

Respondents prefer to migrate anywhere (19%) and to relatively close Asian countries (20%) (Table 3). Of the more developed countries, respondents prefer Cluster 3 (19%) followed by Cluster 1 (9%) – but the USA was mentioned by only two household members, presumably because the country is far from Maldives and popular entertainment depictions of the country tend to demonstrate vast cultural differences from Maldives. The pattern of response is that locations nearer, and perceived to be more culturally similar to Maldives, are preferred migration destinations, which is to be expected.

Countries relatively close to Maldives prevail as the main out-migration destinations (Table 3). Respondents prefer to move to Australia (17%), Malaysia (8%), Sri Lanka (4%) and India (3%).

When we compare levels of education in the household and migration destination, we find some differences. About 32% of respondents from households with university education prefer migration to another Maldivian island (10%) or to Asia (22%), especially to Malaysia (9%), Sri Lanka (4%) and India (3%). Meanwhile, more than 18% of these respondents prefer to move to Australia. As for respondents from households with only secondary school education level, they prefer to migrate to other Maldivian islands (22%) or move to other Asian countries such as India (4%), Malaysia (9%) and Sri Lanka (4%) – and to Australia (15%), New Zealand (2%) and the USA (1%) (Table 3).

Seventeen respondents who chose environmental reasons for migrating prefer to move to Australia and New Zealand (Table 4). Meanwhile, preferred destinations of respondents choosing social and economic reasons are almost equal among three clusters (Europe–USA, Asia, and Australia–New Zealand).

Table 3 Preferred migration destinations by destination cluster and education level

Destination	Total (%)	Secondary and higher education[a](%)	University education[b] (%)
Unknown	25.68	25.61	27.63
Anywhere	18.58	15.85	23.68
Cluster 1: Europe, USA	8.74	7.32	7.89
France	*1.09*	*1.22*	*1.32*
Germany	*1.09*	*1.22*	*1.32*
Ireland	*0.55*	*0.00*	*0.00*
Russia	*1.09*	*2.44*	*0.00*
Switzerland	*0.55*	*0.00*	*0.00*
UK	*2.73*	*1.22*	*2.63*
USA	*1.09*	*1.22*	*0.00*
Cluster 2: Asia	19.67	19.51	22.37
India	*3.28*	*3.66*	*2.63*
Malaysia	*8.20*	*8.54*	*9.21*
Qatar	*0.55*	*0.00*	*1.32*
Singapore	*2.73*	*2.44*	*3.95*
Sri Lanka	*3.83*	*3.66*	*3.95*
Turkey	*0.55*	*1.22*	*0.00*
Cluster 3: Australia, New Zealand	18.58	17.07	18.42
Australia	*16.94*	*14.63*	*17.11*
New Zealand	*1.64*	*2.44*	*1.32*
Cluster 4: Maldives	14.21	21.95	10.53
Total (respondents)	183	82	76

Notes: Percentages are computed from the ratio of respondents preferring the corresponding destination cluster to the total of all respondents intending to migrate (column 2), or the sub-totals with different education levels in columns 3 and 4. Column totals do not sum to 100% because multiple responses were allowed.

[a]Households with at least one member with a college diploma.

[b]Households with at least one member with a bachelor degree or higher.

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Table 4 Reasons for migrating according to destination cluster

Reasons	Intended destination					
	Unknown	Anywhere	Cluster 1: Europe, USA	Cluster 2: Asia	Cluster 3: Australia, New Zealand	Cluster 4: Maldives
Better education, livelihoods, and living conditions (%)	44.68	79.41	87.50	69.44	61.76	26.92
Environmental conditions, disasters and sea-level rise (%)	31.91	23.53	0.00	11.11	50.00	15.38
Other (%)	40.43	14.71	12.50	27.78	26.47	61.54
Total (respondents)	47	34	16	36	34	26

Note: Percentages are computed from the ratio of respondents mentioned the corresponding reason to the total of all respondents preferring the corresponding destination cluster. Column totals do not sum to 100% because multiple responses were allowed.

Table 5 provides respondents' opinions on out-migration of the whole Maldivian population due to sea-level rise in the future. Just under half of the respondents suggested future out-migration as a potential, or necessary survival strategy, with most of this group stating that out-migration will be necessary. A handful considered it to be a future possibility. Nearly one-quarter of respondents did not agree, either because they do not believe that it could happen (the majority view) or that adaptation would be possible (a minority view).

Despite the prevalence of the external construction that Maldivians will need to be evacuated due to sea-level rise, internal views are more varied but less nonchalant than other examinations (Arnall and Kothari 2015; Kothari 2014). The existence of a substantial minority countering the external, top-down constructions of inevitably disappearing islands matches findings from other low-lying atolls which have also been said to be threatened with evacuation due to sea-level rise. Tuvalu (Farbotko 2005; McCubbin *et al*. 2015) and Kiribati (Gaillard 2012) are particularly pertinent in that, similarly to the findings reported here, other issues dominate the climate change agenda locally. Notable among these other issues are day-to-day livelihood concerns, meaning that people are, understandably, less inclined to think about large-scale changes such as mass migration under the hazy future of climate change projections. Yet the view in Maldives differs from that in these other studies, since a large majority suggested that Maldives will need to move due to sea-level rise. The most likely reason is that respondents living in the capital generally have higher educational levels and greater exposure to external views.

Table 5 Respondents' opinions on Maldivians moving en masse in response to sea-level rise

Respondents' opinions	Frequency	Percentage
Do not know	21	6.05
Yes, agree, we will have to move	166	47.84
Not now, but perhaps in the future	11	3.17
Yes, some islands, but not Maldives as whole	2	0.58
No, disagree, do not believe	61	17.58
It is necessary to adapt	18	5.19
Indecisive	3	0.87
No answer	65	18.72
Total	347	100.00

Determinants of migration patterns

Respondents were asked about their intentions to move away from their home location and about their opinion on the 'need to move' strategy. In the previous section, some descriptive statistics were presented. Here, the questions are addressed regarding which factors stand behind their decision to move; and which factors might influence households' opinions that future out-migration is a necessary strategy to deal with the changes in the weather and climate? Both questions may be answered using binary outcome models, i.e. models with binary dependent variables. In this study, a standard logit model (logistic regression) is used. Out of the 347 respondents, 295 could be used for analysis, because of missing values for some explanatory variables in the remainder. The explanatory variables represent various socio-demographic characteristics of the respondents as well as their experiences with weather changes and perceptions of climate change. The results presented contain only the statistically significant variables.

As for the factors influencing household migration patterns, 159 respondents intended to migrate and

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136 did not. Table 6 presents maximum likelihood estimates of the model where the dependent variable was based on the respondents' decisions (or intentions) to move away. As a measure of goodness of fit, the percentage of correctly classified cases was computed. The percentage of correctly classified cases (e.g. respondent answered 'yes' and the model predicts 'yes') is 68.3%. This model is thus considerably better than a purely random model and all the identified factors have the power to discriminate between those who would like to migrate and those who would not.

Table 6 Model – factors influencing migration patterns

Variable	Parameter estimate	Standard error	*p*-value
Intercept	–3.7159	1.2248	0.0024
X_1	0.2493	0.145	0.0856
X_2	0.2092	0.1009	0.038
X_2 squared	–0.00441	0.00254	0.0829
X_3	0.1537	0.1832	0.4015
X_3 squared	–0.0402	0.0274	0.1423
X_4	1.0197	0.252	0.0000

Notes: *p*-values are based on the Wald χ^2 test statistics for the hypothesis test that an individual predictor's regression coefficient is zero given the rest of the predictors in the model. The variables were selected using a stepwise regression approach with probabilities (*p*-values) 0.3 to enter into the model and 0.15 to stay in the model. Statistical significance of squared variables was evaluated jointly with the significance of the corresponding level (non-squared) variable. The dependent variable takes a value of 1 if the respondent intended to move away and 0 if not. Statistically significant variables are as follows:

X_1 = maximum educational level of the household members (1 – illiterate, 2 – can read and write, 3 – elementary school, 4 – secondary school, 5 – high school, 6 – bachelor degree or higher).

X_2 = variable expressing the evaluation of social and environmental living conditions computed as the sum on subjective scale (from 1 – OK, no danger, across 3 – middle threat, to 5 – the worst, with 2 and 4 representing values in between) for six categories: crime, air pollution, rubbish outside, lack of potable water, dirty sea water, and the environment generally.

X_3 = variable expressing the number of weather changes that were noticed by the respondent. It is based on the sum of the number of answers 'yes' to particular changes in the wet season (summer monsoons) and the dry season (in winter) These particular changes included options that summer monsoons and the winter dry season are coming sooner or later; that they are hotter or colder; and that there is more rain or less rain.

X_4 = dummy variable expressing the respondent's opinion about the 'need to move' strategy. This variable equals 1 where the household agreed with the need to move and equals 0 otherwise.

The signs of estimated regression coefficients in Table 6 indicate the direction of influence of the underlying variables. The probability to migrate increases with the maximum education level of household members, perhaps because more education exposes respondents to different ideas, lessening the fear of other locations while increasing their curiosity. Additionally, many Maldivians leave their country for higher education and then return, meaning that they have ties and experience elsewhere, making it easier to contemplate again migration outside their country.

Social and environmental threats are important factors influencing decisions to migrate. Households facing higher social and environmental threats, or with increasing subjective perception of weather changes, are more likely to intend to migrate than those facing lower threat levels. Regarding the negative signs on the quadratic terms, these positive effects on probability to migrate are diminishing in both the mentioned cases. The positive coefficient on the last variable (indicating the respondents' opinion about the 'need to move' strategy) suggests that the decision to migrate is tightly connected with their opinion about the 'need to move' strategy. This result is important, demonstrating that views can translate into action, rather than people simply expressing an opinion with no intention of ever acting on it.

As for the factors determining opinion about the 'need to move' strategy, 160 respondents agreed with 'the need to move because of weather changes' and 135 respondents disagreed. The maximum likelihood estimates are presented in Table 7. This model is able to correctly classify 72.8% of observed cases.

From Table 7, it can be seen that households living longer in their place of residence tend to agree with the 'need to move' strategy less than households living there for a shorter time period. Older respondents tend to agree with the strategy to out-migrate less than younger ones. In examining migration, an assumption is often that younger people are more adventurous and willing to accept change, so they would be predisposed towards migration more than the older generation. Yet the migration literature has long accepted and explored multiple reasons for older people wanting to move and deciding to migrate (e.g. Litwak and Longino 1987; Wiseman 1980). Out of the multitude of reasons for older people supporting migration, the Maldivians might be demonstrating an impetus of parents seeking better lives for their children and grandchildren, especially given their worries about the future. Additionally, the older people have experienced more good times and more bad times

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Table 7 Model – factors influencing the opinion about 'need to move' strategy

Variable	Parameter estimate	Standard error	*p*-value
Intercept	1.2214	1.0558	0.2473
X_1	–0.0244	0.0106	0.0206
X_2	–0.1107	0.0605	0.0672
X_2 squared	0.00122	0.000803	0.1288
X_3	–1.9829	1.1538	0.0857
X_4	0.8663	0.282	0.0021
X_5	–0.6324	0.3966	0.1108
X_6	0.8039	0.3288	0.0145
X_7	0.5389	0.3153	0.0874
X_8	0.0267	0.0101	0.0084

Notes: Model fitting procedures are as defined in the caption to Table 6. Statistically significant variables were as follows:

X_1 = number of years the respondent has been living at his or her place of residence.

X_2 = age of the respondent.

X_3 = dummy variable equals 1 if the respondent comes from abroad, and 0 otherwise (the basic category is the respondent coming from other places than abroad).

X_4 = dummy variable defined using the answers to the question 'Do you intend to move away?'. It equals 1 if the answer is 'yes' and 0 otherwise.

X_5 = dummy variable equals 1 if the household intends to move away but does not know where, and 0 otherwise (the basic category is households knowing the destination where to move or intending not to move).

X_6 = dummy variable equals 1 if the household knows the people who had moved away but the destination was unknown and 0 otherwise (the basic category is households knowing the people who had moved to Europe, USA, UK, Australia or New Zealand, or elsewhere in Malé).

X_7 = dummy variable equals 1 if the household knows people who had moved away and their destination was Asia, and 0 otherwise (the basic category is households knowing people who had moved to Europe, USA, UK, Australia or New Zealand, or elsewhere in Malé).

X_8 = variable expressing the level of negative environmental changes around the place where the lives. It is computed as a sum of level of damages (on a scale from 1 – OK, no danger, across 3 – middle threat, to 5 – the worst, with 2 and 4 representing values in between) experienced by the respondent connected with 11 kinds of changes (number of trees, fisheries, rapid urbanisation, sea water pollution, lack of drinking water, factory-based industry, air pollution, destruction of nature, rapid increase in the amount of tourists, beach erosion, other disturbances).

than younger generations, giving the older people a reason to push for a better life. This discussion reaffirms the need for those exploring climate change migration to include more insights and understandings from the wider migration literature.

Regarding the quadratic term in Table 7, this negative effect is diminishing in absolute terms. To be more specific, the age of 45 represents the point where negative effects change for positive ones. The main possible explanations intersect with the many reasons for older people seeking to migrate (e.g. Litwak and Longino 1987; Wiseman 1980), such as moving to be with their children, wishing to be closer to good health care facilities, and decline in or loss of livelihoods. All three factors in Maldives tend to mean moving to Malé, which is where the questionnaire was implemented.

Further important factors in respondents' opinions on the overall necessity to migrate which emerged are negative experiences with environmental change and the apparent (or assumed) rise in resulting damage. As the results in Table 7 suggest, negative experiences increase the probability that the household will agree with the 'need to move' strategy. This result is not surprising in that negative experiences would be expected to spur on a need for or interest in changing one's location. This finding conforms with evidence from wider literature showing that environmental trends with detrimental impacts can lead to migration choices, although many are left behind because they cannot afford to move or feel that they have no option of moving (Felli and Castree 2012; Foresight 2011). Respondents to this question in Maldives are demonstrating migration as adaptation to negative experiences with environmental change, seeking the advantages which the literature reports (Birk and Rasmussen 2014; Black *et al*. 2011b; Tacoli 2009).

Respondents knowing people who had moved away, but whose final destinations were unknown or to Asia tend to agree with the 'need to move' strategy more than those who know people who had moved elsewhere or who had stayed in Malé. According to the respondents, those moving to Europe, the UK, the USA, Australia or New Zealand are moving there mostly for better education, or because they had already received better education and wished to use it to obtain better jobs. The decision to migrate to these countries may thus influence others regarding the need (or desirability) to move. This effect is found frequently in the mobilities literature, where non-migrants are more inclined to consider migration when they know someone who has left, and to prefer destinations where they know people already or where others have already lived (e.g. Bedford and Hugo 2012; Epstein and Gang 2006).

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This behaviour has three important implications. First, educated young people deciding to migrate abroad will negatively influence the average educational level of the Maldivian labour force. Second, the older generation might choose to or feel obliged to follow the younger generation, to be with their children and grandchildren, as alluded to above. Third, the observed migration tendencies may result from positive migration experience of relatives or friends (see also Epstein and Gang 2006), not just perceived environmental reasons. These patterns match the patterns expressed in the migration and mobilities literature referenced throughout, indicating that climate change might not (yet) bring much which is new to the decision-making processes of Maldivians considering whether or not to migrate.

Conclusion

Although sea-level rise is a major projected climate change impact for Maldives and is perceived by Maldivians to be a concern, it is disputable if ongoing adaptation measures are sufficient to enable the country and its people to deal with its projected futures. Although a set of various adaptation measures is being considered and some are being implemented – such as sea walls, land reclamation, beach vegetation, relocation, warning systems, and whole-island elevation changes – uncertainties about future climate change and its impacts remain. Even though it is not perceived or experienced as an everyday reality in and around Malé, the future climate change threat and out-migration option have, to some extent, become slowly rooted in people's minds – at least to the point where they consider it even if their migration-related motivations still remain with other factors.

Regarding migration as adaptation, contrary to Arnall and Kothari (2015), who seem to underestimate ordinary people's perceptions of climate change and find that they focus more on everyday livelihood challenges than on long-term solutions, a comparatively high proportion of our respondents was familiar with the potential necessity for out-migration and the possible climate change links. Yet awareness of these links and ability to discuss them do not necessarily directly influence actual opinions and decisions. The reason is that expressed views occur in the context that Maldivians are already migrating out of Maldives – and have long done so – without considering climate change. Reasons for migrating encompass education, health care, social position, politics, jobs and livelihoods (Kelegema 2011; Kothari 2014; Sathiendrakumar and Tisdell 1987). This situation is not unique to Maldives, but occurs in many other small island states, with migration having been an important component of life and livelihoods since these islands were first settled (Bedford and Hugo 2012; Kelman *et al*. 2015; Le De *et al*. 2015; Rudiak-Gould 2013; Shen and Gemenne 2011; Stojanov *et al*. 2014).

Nevertheless, these findings do not imply that Maldivians see out-migration as an easy or desirable adaptation measure. As the results outlined above and the discussion show, other adaptation measures are considered and many would prefer to implement these first, rather than prioritising migration with respect to climate change. The ongoing efforts to implement development processes in Maldives (e.g. Alexander and Mercer 2012; MEEW 2007, van Alphen et al. 2008) demonstrate the efforts put into keeping the country viable for lives and livelihoods. This situation matches similar efforts in many other small island states where development work not related to climate change can continue in parallel with climate change adaptation measures, sometimes being complementary (e.g. for Seychelles, Mercer *et al*. 2014) and sometimes causing tensions (e.g. for Kiribati, Gaillard 2012).

Overall, it appears as if Maldives is aiming to adapt to projected climate change impacts with a combination of hard and soft measures, neither just implementing stop-gap measures nor abandoning the country (Elrick-Barr *et al*. 2015; MEEW 2007; Republic of Maldives 2010; Sovacool 2012). Moreover, Maldivians in the capital area are reasonably well informed and have a knowledge baseline covering ongoing and future climate change impacts, as well as possible responses to those impacts, of which migration is certainly an option. None of this significantly impacts Maldivians' views of or interests in migrating, but decisions will be based primarily on reasons other than climate change.

Thus, migration as adaptation has traction among Maldivians in Malé, but is not considered to be a principal or desired option. This attitude matches two main threads in the 'migration as adaptation' literature discussed above. First, migration as adaptation is a viable option, and has advantages, but may often be implemented in conjunction with other measures. Second, migration as adaptation does not mean forced or involuntary migration, so those migrating would not wish to be labelled as 'climate refugees' or 'climate change refugees'. Irrespective of the combination of adaptation measures ultimately adopted, they should not be implemented in a top-down fashion but, as suggested by Alexander and Mercer (2012), ordinary Maldivians must be included in wider discussions about future trajectories of their livelihoods and homeland.

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