

# Adaptive Capacity for Climate Change in Maldivian Rural Communities

Ibrahim Mohamed, David King and Alison Cottrell

## Abstract

The research presented in this paper studied the functional linkages between risk and adaptation appraisal and the psychosocial discourse variables that influence the outcomes for adaptive capacity of island communities to the impact of climate change. Qualitative data was gathered from focus group discussions and semi-structured interviews in five, purposively selected communities of the Maldives, from June to December 2015. The findings showed that risk appraisal was enhanced by direct experiences encountered and social construction of climate change. We found that a negative appraisal of adaptation arises due to lack of resources, fatalism and wishful thinking. While objective adaptive capacity was low, a higher subjective adaptive capacity was observed. The results also showed that people's ecological knowledge of the reef-island systems depended on their livelihood practices, and that changes to modern livelihood practices can lead to loss of deep ecological knowledge and lead to dependency on external data only for adaptation. The findings add to the research on importance of meanings, ideas, behaviours and values of people, and the agency of such variables for positive appraisal of risks and adaptation.

**Keywords:** *adaptive capacity, risk appraisal, adaptation appraisal, climate change*

---

### The Author

1. Ibrahim Mohamed, Environmental Protection Agency of the Maldives, Email: [ibrahim.mohamed@epa.gov.mv](mailto:ibrahim.mohamed@epa.gov.mv)
2. David King, College of Science and Engineering, James Cook University, Townsville, QLD 481, Australia
3. Alison Cottrell, Centre for Disaster Studies, James Cook University, Townsville, QLD 4811, Australia

# 1. Introduction

Climate change is a complex, global phenomenon caused by human actions, triggering increase in long-term gradual environmental changes and intense weather events (Intergovernmental Panel on Climate Change, 2013). Even with the most ambitious mitigation actions to reduce greenhouse gas emissions, and keep global average temperatures within 2°C above the preindustrial times, the inertia of the system is expected to continue for centuries. Hence, adapting to the changes in climate is urgent for survival, especially for low-lying, small atoll communities such as the Maldives, and Tuvalu.

It is unknown whether all of the 1190 low-lying small islands of the Maldives will be destroyed by sea-level encroachment since natural islands on reefs are dynamic and growing entities (Kench, Ford & Owen, 2018). However, sea level rise and associated erosion and salinization of fresh water lenses, ocean acidification, and extreme weather conditions, are expected to destabilize the coral reefs and freshwater lenses on which Maldivian lives and livelihoods depend (Intergovernmental Panel on Climate Change, 2014), as early as mid-century.

Maldives has a homogenous Sunni Muslim population which is highly reliant on the coral reef ecosystem for livelihood, mainly fisheries and tourism. Basic literacy rate is nearly 100% and life expectancy is 77. Though the GDP per capita for 2018 was US \$11,890 (Ministry of Finance and Treasury, 2017), a tenth of the rural population live below the poverty line of approximately 5.5 US\$ per day compared to 1.5% of the urban population. Employment opportunities in the inhabited islands are limited to mainly fishing and farming for local consumption. Most of the men work in tourist resort islands whilst women engage in livelihood activities available on the home island. Even though, the Maldives as a nation may be highly resilient and innovative in adapting to climate change, resources and knowledge available to remote, rural communities vary, depending on several socio-cultural and economic factors.

The purpose of this study was to understand the social phenomena of climate change which influence individual adaptation and the adaptive capacity of five rural island communities of the Maldives.

## 2. Literature Review

The social discourse of climate change is driven by aspects of climate change such as the collective threat, common but differentiated impact scales, precarious destabilization of systems, and diffuse nature of cause and effects (Pearson, Schuldt & Romero-Canyas, 2016). These features lead to psychological processes that form the basis for adaptive actions by people (Pearson, Schuldt and Romero-Canyas, 2016). Social construction is the process whereby people

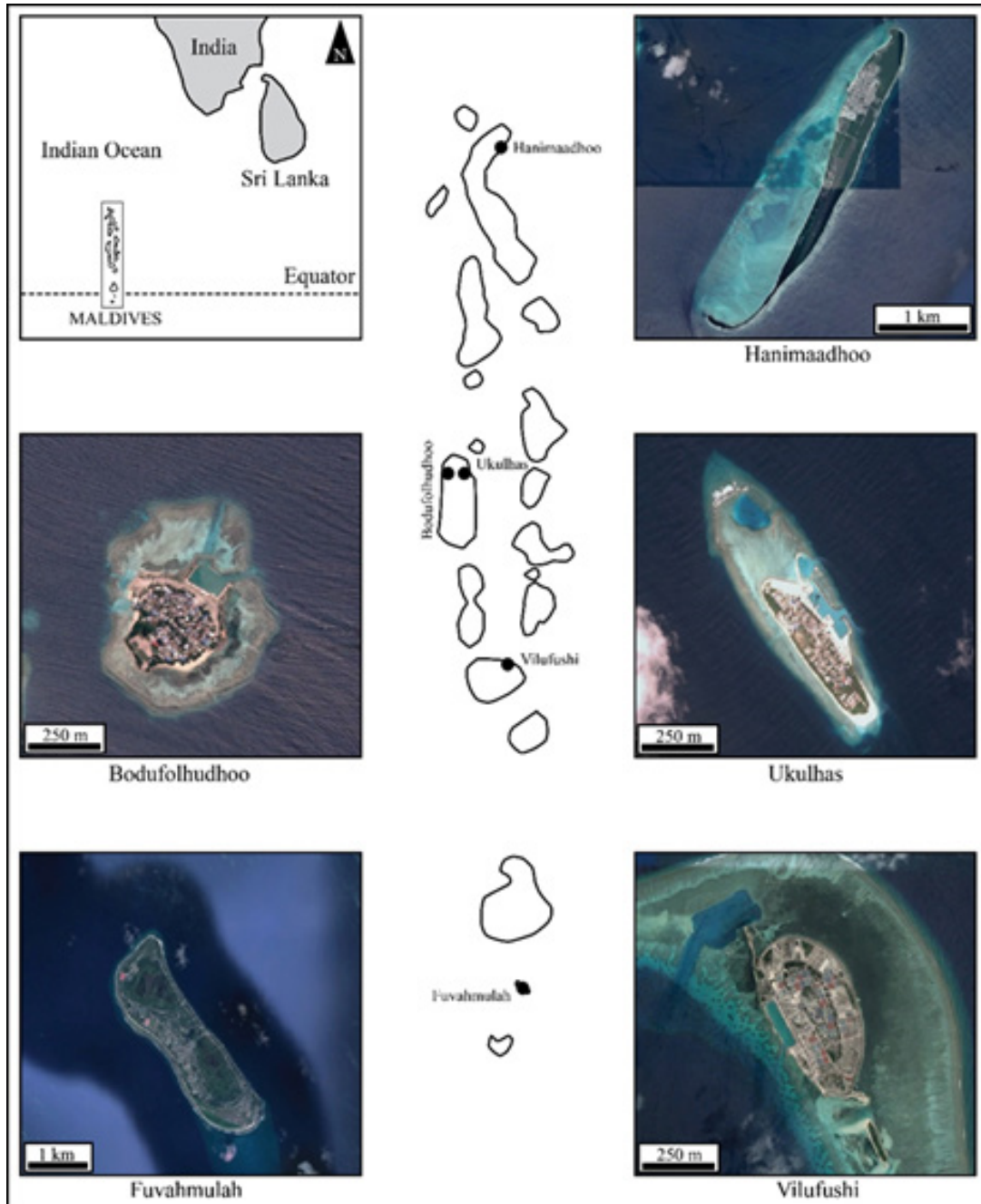
determine a sense of reality of a phenomenon through their mundane actions and interactions, while social representation depicts the reality constructed in terms of commonly shared knowledge, images, and communications (Reser & Swim, 2011). Both social construction and representation are influenced by socio-cultural processes including worldviews, cultural and faith practices and beliefs; and beliefs about climate change. Consequently, adaptive capacity of individuals and communities is highly influenced by socio-cultural and socio-cognitive factors (Clayton et al., 2015; Granderson, 2014).

Human dimensions of adaptive capacity can be regarded as constructs of perceived risks and perceived capacity to cope and adapt, through socio-structural opportunities available to people, and their cultural values and beliefs (Etkin & Ho, 2007). Islandness is a specific socio-ecological construct utilized for this study. Islandness is described as an embodiment of relationships reinforced by a range of sensory engagements of islanders with their social ecological environment (Vannini & Taggart, 2013). Furthermore, islandness also accommodates how islanders endure and live with the 'bio-geo-physical' dynamics of natural events. For instance, islanders' routine, every day processes used in shifting their ways of life within the dialectical interplay of social and ecological processes, provides agency for coping and adaptation (Ingold, 2000; Vannini, Waskul, Gottschalk, & Ellis-Newstead, 2012; Vedwan, 2006). Coping appraisal and risk appraisal are critical to address external environmental stresses and their effects on wellbeing (Folkman, Lazarus, Dunkel-Schetter, DeLongis & Gruen, 1986; Grothmann & Patt, 2005a, 2005b; Warrick, Aalbersberg, Dumaru, McNaught, & Teperman, 2017). When the perceived severity and probability of risks become greater, affective responses are initiated, leading to higher coping appraisals and enhanced adaptive actions at individual and community level (Swim et al., 2011). Consequently, individual and community level perceptions of risks and experiences are critical for adaptive actions and behaviors (Adger et al., 2009), and hence can be studied by advancing the theory of islandness.

### 3. Methodology

Participatory Climate Change Adaptation Appraisal (PCCAA), as proposed by Moser and Stein (2011) was conducted as an ethnomethodology. The PCCAA involved active engagement of the primary researcher with focus groups to explore islanders' experiences of extreme climate driven events, and how psycho-social factors lead to adaptive actions.

Data was collected from five case study islands, purposively selected based on extreme variation in bio-geo-physical and socio-demographic features present on Maldivian islands. The islands chosen were Hanimaadhoo, Ukulhas, Bodufolhudhoo, Vilufushi and Fuvahmulah. Figure 1 shows the geographic location of the islands on the atoll reefs and the natural shapes of the islands and the adjoining house reefs.



**Figure 1:** The geographic location of the five islands and google earth pictures of the five islands.

Location of the island in the atoll, current land area, population density, urban sprawl and remoteness of the five islands are given in table 1.

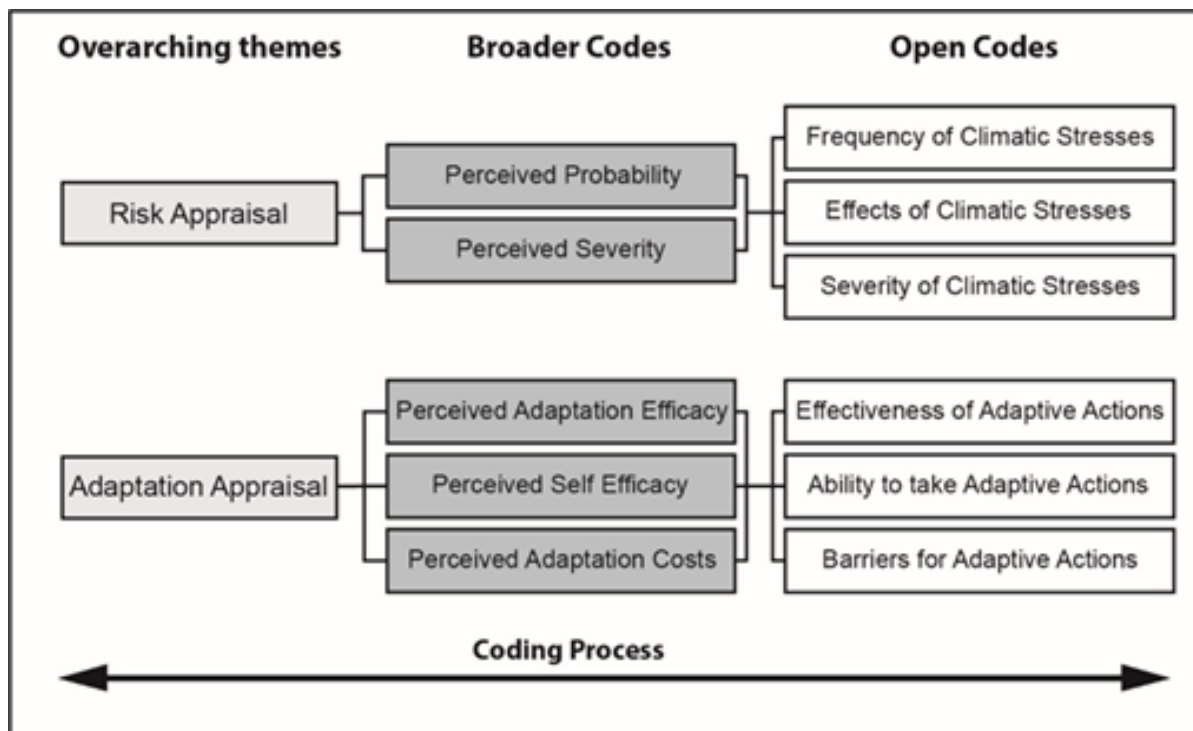
**Table 1:** Land area, population, population density, urban sprawl and distance from the capital city, Male', for the five research islands (National Bureau of Statistics, 2019).

	<b>Bodufolhudhoo</b>	<b>Fuvahmulah</b>	<b>Hanimaadhoo</b>	<b>Ukulhas</b>	<b>Vilufushi</b>
<b>Island Position</b>	Within the basin of North Ari Atoll	Single reef top island	Eastern periphery of Haa Dhaal Atoll	Within the basin of North Ari Atoll	Eastern rim of Thaa Atoll
<b>Land area per hectare</b>	11.0	493.0	299.2	22.0	58.7
<b>Resident Population</b>	608	8,510	1,951	1,005	1,103
<b>Population density per hectare</b>	55.5	17.3	6.5	45.6	18.8
<b>Urban sprawl per hectare</b>	6.3	158.3	124.8	18.8	50.2
<b>Distance from Male'/km</b>	81.6	497.0	289.9	17.3	186.8

Population density is highest in Ukulhas and Bodufolhudhoo, the smallest two islands chosen for the study. They are also in the basin of the atoll. However, Fuvahmulah and Hanimaadhoo, the largest two islands, with the lowest population density, have significant urban sprawl, due to the land made available for housing, industries and airports in these islands.

From each of the five islands, five key research participants were selected for separate male and female focus groups. These included elders, fishermen, farmers, civil servants, and representatives of community-based non-governmental organizations. Semi-structured interviews were conducted with consenting participants selected from all of the focus groups. These interviews were conducted as structured conversations exploring knowledge of participants, built through their experiences of climate change threats and adaptation (Dumay & Qu, 2011).

Interview data was thematically analysed and coded using an iterative, reflexive approach (Feredey & Muir-Cochrane, 2006; Braun, Clarke, & Terry, 2014). Thematic analysis concepts from Elo and Kyngas (2008) were also used to guide the analysis and interpretation of data. Figure 2 shows the coding matrix used to categorise and analyse the data to identify the adaptive capacity of the communities.



**Figure 2:** Coding matrix for social discourse and psychosocial aspects of adaptive capacity.

## 4. Results and discussion

The socio-cultural, environmental, and geographical aspects of the five islands that influence climate change appraisals is presented, followed by the islanders' risk appraisal, perceived adaptation efficacy, perceived self-efficacy, and perceived adaptation costs and their motivation to adapt.

### 4.1 Socio-cultural and environmental context

All of the islands were characterized by low-lying flat topography, vulnerable coastal hydrodynamics, and deficiency in access to fresh water and land. Major land reclamations have been carried out on Vilufushi, and Ukulhas. Vilufushi was developed as a safe island and elevated 3 metres above sea level when reconstructed after the 2004 Tsunami devastation of the island. It has a 2 km long coastal rock revetment around the whole island to mitigate erosion. All of the five islands have had coastal modifications including foreshore breakwater, entrance channel protection, harbour breakwater, and quay wall constructions. Only Fuvahmulah has flood water channels.

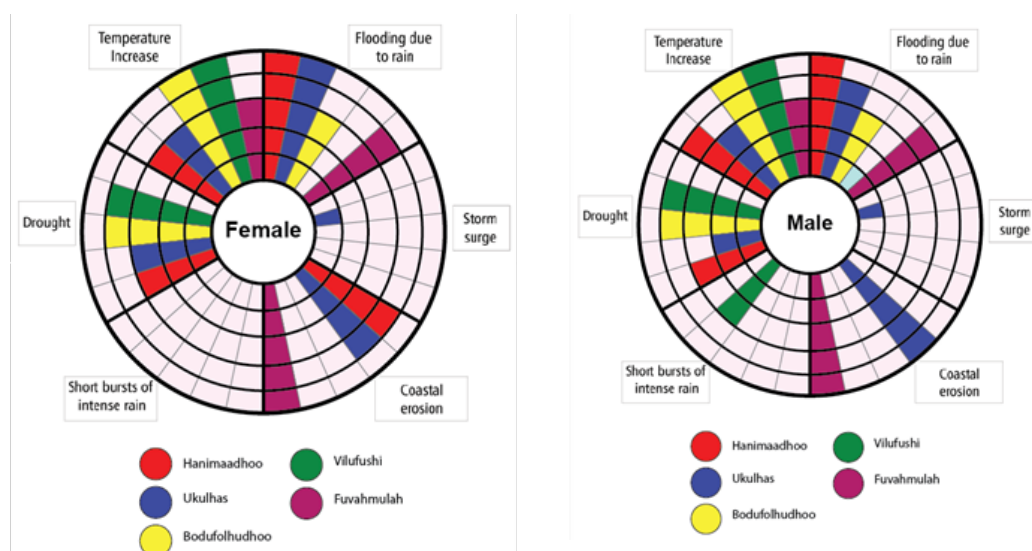
The islands have had tremendous socio-cultural changes and increases in population since

the 1970s, leading to loss of vegetation, and deterioration of freshwater lenses. Although Hanimaadhoo and Fuvahmulah have airports, and the other islands are connected by ferries, both modes of transport are affected by climate related stresses such as stormy weather. Participants from all of the islands, except Fuvahmulah, reported facing shortages in food availability during stormy weather, since food supply is mainly through sea transport. Fuvahmulah, due to its' isolation and large size, had traditionally grown enough food for its inhabitants.

According to field observations, deterioration of the freshwater lens is most critical for Bodufolhudhoo, followed by Ukulhas. The small width and area of both islands exacerbates the deterioration of freshwater lenses. Freshwater salinization was of least concern in Fuvahmulah, followed by Vilufushi. Based on both freshwater lens deterioration and land degradation due to urban expansion, the biggest impact was observed in Bodufolhudhoo, followed by Ukulhas.

## 4.2 Risk perception analysis by gender

Figure 4 (a) and (b) show the frequency of extreme weather events experienced by islanders based on women's and men's focus group discussions, respectively. The oval grid lines indicate intensity of different impacts based on thematic analysis of the focus group discussions. The findings revealed that all of the five islands face multiple risks annually, such as flooding due to heavy rainfall, and droughts. Some threats are experienced seasonally, such as coastal erosion and temperature increases. Vilufushi experiences the least number of threats while Ukulhas faces the most threats. The results also showed that, at a household level, the highest consequences are felt due to flooding during heavy rain fall, causing extensive damage to household assets.



**Figure 3:** Key informants' perceptions of climate change related events based on female and male focus groups, regarding intensity and frequency of events.

All of the island communities have experienced discrete, extreme events such as flooding due to heavy rain and/or storm surges within the past 10 years. Additionally, they reported continuous prolonged and aggravated events such as droughts, coastal erosion and increase in temperature. A consensus was observed in linking global climate change with the frequency of extreme weather events. However, some of the participants perceived threats such as coastal erosion to be exacerbated due to actions such as extensive coastal modifications, destabilizing the islands' natural systems.

Storm surges were experienced in Ukulhas only, while short bursts of intense rain was perceived as a risk by only the female participants of Vilufushi. According to the participants' risk appraisal, storm surges and short bursts of intense rain were among the impacts with the least severity.

### 4.3 Perceptions on risks of extreme events due to climate change

**Temperature increase.** The increase in temperature was widely noted and consistent across all of the five islands. Temperature increase was perceived to be intensifying recently and most of the participants recalled a gradual increase since 2012. Severity of temperature was a major risk for Bodufohduhoo and Vilufushi, while the other three island communities considered it a moderate to high risk. The analysis showed that the total vegetation cover of Vilufushi and Bodufohduhoo were the lowest compared to the rest of the islands in this study.

Most of the participants believed that the increase in temperature is most intense during the North East (NE) monsoon from December to February and during the inter-monsoonal period from March to April. The increase in temperature was also perceived to be associated with low rainfall during this period.

**Flooding due to rainfall.** People perceived that flooding due to rainfall is becoming more frequent. In all of the islands except Vilufushi, flooding due to heavy rainfall was considered a substantial risk. As most of the roads on Vilufushi are paved with soak pits, flooding due to rainfall is minimal there. Participants from Hanimaadhoo believed that rainfall had increased in recent years; hence, incidence of flooding was becoming more frequent. Participants from Hanimaadhoo recalled their experiences of flooding in 2007 and 2013 in making their observations. On Ukulhas too, severe flooding was experienced in 2002 and 2007. Bodufohduhoo islanders have not experienced severe flooding in recent times, but moderate flooding occurs annually during heavy rainfall. However, severe flooding events that occur as decadal events have now become more frequent according to most of the participants. For instance, Fuvahmulah participants used to experience severe flooding once every 10 years in the past, but flooding is now experienced once every two years. Usually, southern atolls experience more rainfall, and hence, are more prone to flooding due to rain (Ministry of Environment and Energy, 2016).



**Drought.** Participants reported that, compared to the past, rainfall during the North East monsoon has decreased, causing prolonged droughts lasting for three to five months annually. While Fuvahmulah participants did not appraise drought as a risk, islanders from Bodufolhudhoo and Vilufushi considered it a substantial threat. Hanimaadhoo and Ukulhas communities considered it was a moderate risk. Participants also experienced shifts in rainfall patterns, and mentioned that the intense rainfall predicted during South West (SW) monsoon has become more erratic since 2000. For instance, some of the participants mentioned that the predicted monsoonal rain experienced in June and July has now shifted to short intense events, occurring mainly during August and September. However, on Fuvahmulah, people have not experienced droughts, as a gradual increase in rainfall is experienced there, compared to the other islands.

**Coastal erosion.** Participants from Fuvahmulah, and Ukulhas perceived that the highest risks were from coastal erosion. Hanimaadhoo experiences moderate erosion in a localized area near the harbour, and most of the participants stated that the erosion was caused by coastal destabilization due to the construction of the harbour. The people of Fuvahmulah perceived coastal erosion as the most intense climate change related environmental threat facing the island. Participants mentioned that erosion has been ongoing on Fuvahmulah since the 1980s, but became severe after the construction of the harbour in 2007. Participants from Fuvahmulah perceived both climate change and coastal destabilization as having a cumulative effect on severity of erosion.

**Storm Surges:** Storm surges, and inundation from storm surges, were not perceived as major risks by the participants. Participants from all of the islands recalled few incidences of storm surges, but have not experienced any severe events in the past 10 years, except on Ukulhas. On Ukulhas, moderate inundation was experienced on the eastern side in 2011. Participants from Ukulhas believed that such inundation occurs due to storms generated in the Indian Ocean, far from the Maldives. The eastern side of Ukulhas is exposed to the inter atoll channel between Rasdhoo Atoll and Ari Atoll, where waves can be funneled during storm surges.

#### 4.4 Context of imaginaries in risk perception

Participants utilized experiences of variations in weather, such as temperature increase, and rain fall patterns, in their perception of climate change risks. This result may be explained by the fact that, in local language, both weather and climate change are referred to with the noun “*moosun*”. Despite this single noun used in describing both phenomena, participants demonstrated a clear understanding of the changing weather compared to the past. This implies that the meaning and usage of the word “*moosun*” by participants is synonymous with climate change. Although participants had limited scientific understanding of the uncertainties and

complexities of climate change impacts, they demonstrated a good understanding of extreme weather events. This perception of risks might be informed by the characteristics of islandness. For instance, a key informant said:

Now there is hardly anyone who refutes climate change. For example, during “adha”, [a stormy period marked in the South West Monsoon calendar] the seas get rough [swells]. The place where the petrol shed is built always gets storm surges during adha, and this is known to many people. So, when a jetty construction was planned for that area for fuel unloading, many people raised concerns about the high risks of inundation. (Uku 04).

A contradiction was seen among women’s and men’s focus groups from Hanimaadhoo, and Vilufushi. In Hanimaadhoo, women did not attribute coastal erosion to the direct impacts of climate change. On Vilufushi, women perceived short bursts of intense rain as a major risk linked to climate change. These contradictions may have arisen as women may have had direct experience of short bursts of rain through involvement in home gardening or other household chores, while men are more likely to observe changes in the coastal environment. Consequently, the islanders’ everyday life activities and ways of life in the island and their engagement with their environment, influences their perception of risks (Vannini & Taggart, 2013). As such, the perception of risks of climate change impacts are understood and structured through individual experiences carved into the social-ecological system of the islands, as a “mode of active perceptual engagement” (Ingold, 2000; Vannini & Taggart, 2013). One participant commented:

Now we experience less rainfall and increased temperature. Also, coral in the lagoon is bleaching. We can’t bear the heat now.... Now we see more extreme conditions unlike in the past (Vilu 04).

According to the theory of islandness, islanders share their public realm and social life, and share common values and knowledge (Vannini, 2011). Consequently, islanders’ perception of climate change risks is socially constructed as a shared view with other members of the island community (Reser & Swim, 2011). This theory further supports similarities of risk perception observed among most islanders in our case studies. Likewise, social representations as consensual understanding of climate change, interpreted and depicted through sources such as media, books or documentaries as well as social interactions, may also have led to such similarities in risk perceptions (Reser & Swim, 2011). Thus, risks and threats perceived by islanders are not necessarily acquitted to scientifically determined risks (Granderson, 2014; Warrick et al., 2017). One elderly informant revealed his past experiences, saying:

When we were young, the heavy rain of “Hay Nakaiy” [a period marked in the local monsoon calendar] continued for one month, and we got nonstop rain for 14 days.... During those days, we had very accurate and predictable weather patterns... but it is very different now. Everything has changed (Vilu 03).

Similar to findings by Neeraj and Robert (2001), visual salience and impacts on livelihoods and property are the major factors influencing risk perception. Hence, intra and inter island risk perceptions in this studies were predominantly similar, as most islanders face similar climate change impacts in relation to the biophysical conditions of their islands.

Perception of climate change risks and understanding of causality also could be related to imaginaries of risks perceived through cultural values and worldviews. For instance, participants widely referred to God, in relation to severity and probability of risks. About 30% of the respondents identified climate induced extreme events as an act of God. Participants believed that the will of God cannot be changed, and that the extreme events exacerbated by climate change are a divine sign of the end of the world. Talking about this, one interviewee said:

If any such thing [extreme events] happens, what I do is pray to Allah for help.  
A few days back, the sky became dark and stormy in the middle of the night.  
I was here, and I made supplications to Allah, and the storm calmed (Vilu 02).

Although the number of participants associating risks with divine retribution was few, this ideology implies how knowledge of risks is constructed to comprehend the complexities and uncertainties, as well as the distant and eventual nature of risks such as those related to climate change (Clayton et al., 2015). Views found in the Maldives associating God with issues that are difficult to be framed through rational reasoning, were also seen in Tuvalu by Barnett and Campbell (2010), and in Fiji by Lata and Nunn (2012). Accordingly, people who perceive and appraise climate change impacts as divine retribution either become fatalistic and avoid taking effective coping and adaptive actions (Lata & Nunn, 2012), or take it as a warning to prevent causing harm to the environment. Perceptions of most participants associating God with the extreme weather events in this study demonstrated that their beliefs functioned as a warning sign to act rightfully and to live as good humans. Hence, a sense of higher self-efficacy in coping is demonstrated. Additionally, participants' perception of God being in control harnesses into actions such as special congregational prayers, enhancing social bonding and cohesion among the communities. Consequently, association of God in the Maldivian context provided a higher cognitive appraisal of risks enhancing coping.

Participants identified changes in weather patterns, shifts in seasons, and impacts on coastal marine resources, as well as destabilization of beaches, in the last decade or so. However, elderly participants portrayed detailed knowledge of changes and were able to link such changes to livelihood activities, such as fishing and farming, pertinent to their observations and dialectical relationship with their environment. For instance, an elderly participant mentioned:

The reef has changed a lot. Due to extreme heat, corals like the big boulder ones died, and are now covered in algae.

This was similar to what Ingold (2000) described as the dynamic relationship between ‘affordances’ of the environment and the ‘effectivities’ of the islanders. With the loss of traditional livelihood activities on islands, traditional environmental knowledge on climate change risks based on islandness is under threat, making scientifically framed risk assessments, the only source of knowledge. The results indicated that people utilized local knowledge and ecological awareness to assess severity and probability of risks when their livelihoods were affected by climate change. The findings demonstrate that personal experience, and social construction based on islandness, plays a crucial role in risk perception in island communities.

The findings also show that social representation and social amplification (Reser & Swim, 2011) are less significant in the risk perception of islanders. For instance, participants did not identify sea-level rise as a major risk threatening them, as amplified in social representations or in risk signals portrayed through various external sources such as the mass media. Despite this, some focus group participants raised concerns regarding sea-level rise. Hence, unlike the predictions of social representation theory and social amplification theory, where media and institutionalized authority significantly influence public risk perception, this study found people were more dependent on social discourse and personal experience in their perception of risks. While both mass media and national institutions emphasize sea-level rise as the most daunting threat from climate change to Maldivian islands, participants in this research did not consider sea-level rise as a direct threat. This may not necessarily indicate islanders undermining sea-level rise as a major threat, but instead may be due to reframing of scientific understanding of sea-level rise from a local perspective (Reser & Swim, 2011). Even the participants who perceived erosion as a major risk, did not directly link erosion with sea-level rise. People believe that the coral reefs can continue to grow to keep pace with sea levels and maintain island stability. Hence, the major finding is that local perception of risk is not necessarily based on risks framed externally by institutions outside the communities. Despite this, people’s perceived risks fit into scientifically observed changes given in the Climate Change Policy of the Maldives (Ministry of Environment and Energy, 2016) as agreed by Byg & Salick (2009). Consequently, in communicating climate change risks and adaptation measures to island communities, risk perceptions framed and understood by islanders should be used in justifying scientifically determined risks, instead of relying entirely on externally derived information.

#### **4.4 Context of imaginaries in risk perception**

Regarding coping appraisal and perceived adaptation efficacy, a common finding from all of the five islands was that participants used a range of socio-structurally developed opportunities

for their adaptive actions, both at community and at household levels. Participants anticipated their coping strategies and adaptive actions as generally having desired outcomes in coping with extreme events. On all of the islands, the raising of the floors of homes was perceived to minimize damage caused to homes and assets due to flooding. To adapt to heat, participants mentioned purchase of fans and air conditioners. At community level, planting trees was also considered as an adaptive strategy to reduce the temperature increase. Maintenance of coastal vegetation and minimizing coastal destabilization were regarded as adaptive mechanisms to reduce coastal erosion. Coping responses included both coping strategies and proactive adaptive action.

The findings from this study confirm that intrinsic motivation is a critical factor for responding and adapting to abrupt environmental events as described by Kollmuss & Agyeman (2002). As proven by Protection Motivation Theory (PMT), when people perceive efficacy in their adaptive responses, high coping appraisal is achieved (Mortreux & Barnett, 2017) as found in this study. Grothmann and Patt (2005a), also argue that when perceptions of severity and probability of risks, adaptation efficacy, self-efficacy, and benefits compared to the costs of adaptive actions are high; people become motivated to engage in proactive and reactive adaptation strategies. This study showed that, due to increased living standards and financial capacity, people tend to invest more in home construction and in buying more assets. Hence, they anticipate a higher monetary loss from climate change impacts, making them initiate and engage in adaptive and event-driven responses. However, many participants agreed that transformative adaptive actions is hindered due to lack of financial support mechanisms such as insurance schemes, credit facilities and social assistance programs.

Social bonding, linking and cohesion act as a major motivating factor. Despite this, participants perceive their social cohesion and bonding has started to weaken due to social, economic and political transformations on islands. These results validate the findings of Schwarz et al. (2011), who confirmed that social bonding and linking and collective community actions in islanders are weakened by monetization of social interactions among people, and through indirect effects of modernity and democratic politics. Most participants in our case study islands reported weakening of their social bonding due to individualism and political divisions within the island community.

Findings from our study indicated that the high dependency on government aid lowered the motivational state of communities. For instance, on Vilufushi, the Tsunami Recovery Program provided various assistance mechanisms, such as financial aid and extensive reconstruction and recovery programs. This has led to a perception that the government will and should assist the community in all climate change driven extreme events. Although this victim mentality arises from wishful thinking, people also have a genuine concern regarding the limited livelihood

opportunities on the island after resettlement. People raised the issue of lack of opportunities to engage in home based economic activities such as fish processing, carpentry, retail, and homebased agriculture, due to the lack of space in the new housing units provided to them. Additionally, their traditional islandness and way of life has changed after being reconstructed as a semi-urban town. As proven by Protection Motivation Theory model, such barriers lower subjective adaptive capacity, as the motivational state of people is lowered. Even with physical infrastructure, subjective adaptive capacity or adaptation intention is lowered by wishful thinking arising from dependency on aid and incompatible suburban dwellings. Thus, people are often forced to rely on event-driven coping strategies, while proactive transformative adaptation has become deficient. For instance, people on Vilufushi perceived a higher objective capacity, as all homes were built to a high standard and the island was rebuilt as a safe island. Consequently, adaptive capacity is not necessarily influenced by tangible physical infrastructure alone, but also by subjective capacity, while adaptation intention depends on self-efficacy.

## 5. Conclusion

The Maldives is highly vulnerable to climate change, making it imperative to understand the psychosocial elements which influence adaptive capacity. The imageries of risks perceived by participants in this study indicate that risks are understood from experiencing them, and are socially constructed as a shared view among the community. This is influenced by visual salience and impacts on livelihoods. Cognitive biases such as the association of God with risk perception, and elevated expectations of government aid, are leading to fatalism and wishful thinking, respectively. Additionally, the findings confirmed that people had a higher perceived self-efficacy, and that the perceived costs of adaptation were high, leading to high intrinsic motivation for adaptation. The results show the importance of communication of risks pertinent to islanders' perceptions, and social discourse, to engage and empower them for transformative adaptive actions and through behavioral changes. While a lack of emphasis on adaptation is prominent, research is needed on the efficiency of governance in reinforcing transformative adaptive strategies, and in creating awareness to avoid unintended maladaptation resulting from event-driven reactive responses.

## References

- Adger, W. N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R., Naess, L.O., Wolf, J. & Wreford, A. (2009). Are there social limits to adaptation to climate change? *Climatic Change*, 93(3), 335-354.
- Barnett, J., & Campbell, J. (2010). *Climate Change and Small Island States: Power, Knowledge and the South Pacific*. London: Earthscan.
- Bradley, G. L., & Reser, J. P. (2017). Adaptation processes in the context of climate change: a social and environmental psychology perspective. *Journal of Bioeconomics*, 19(1), 2951. doi:10.1007/s10818-016-9231-x
- Braun, V., Clarke, V., & Terry, G. (2014). Thematic analysis. In Poul Rohleder & Antonia C. Lyons (Eds.), *Qualitative Research in Clinical Health and Psychology* (pp. 95-114). New York: Palgrave MacMillan.
- Byg, A., & Salick, J. (2009). Local perspectives on a global phenomenon—Climate change in Eastern Tibetan villages. *Global Environmental Change*, 19(2), 156-166. doi:https://doi.org/10.1016/j.gloenvcha.2009.01.010
- Clayton, S., Devine-Wright, P., Stern, P., Whitmarsch, L., Carrico, A., Steg, L., Swim, J., & Bonnes, M. (2015). Psychological research and global climate change. *Nature Climate Change*, 5(7), 640-646. doi:10.1038/nclimate2622
- Dumay, J., & Qu, S. Q. (2011). The qualitative research interview. *Qualitative research in accounting & management*, 8(3), 238-264. doi:10.1108/11766091111162070
- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107-115. doi:10.1111/j.1365-2648.2007.04569.x
- Etkin, D., & Ho, E. (2007). Climate Change: Perceptions and Discourses of Risk. *Journal of Risk Research*, 10(5), 623-641. doi:10.1080/13669870701281462
- Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development. *International Journal of Qualitative Methods*, 5(1), 80-92. doi: 10.1177/160940690600500107.
- Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology*, 50(5), 992-1003.
- <http://dx.doi.org/10.1037/0022-3514.50.5.992>
- Granderson, A. A. (2014). Making sense of climate change risks and responses at the community level: A cultural-political lens. *Climate Risk Management*, 3, 55-64. doi:http://dx.doi.org/10.1016/j.crm.2014.05.003
- Grothmann, T., & Patt, A. (2005a). *Adaptive capacity and human cognition*. Paper presented at the Open Meeting of the Global Environmental Change Research Community, Montreal, Canada
- Grothmann, T., & Patt, A. (2005b). Adaptive capacity and human cognition: The process of individual adaptation to climate change. *Global Environmental Change*, 15(3), 199-213. doi:http://dx.doi.org/10.1016/j.gloenvcha.2005.01.002
- Ingold, T. (2000). *The perception of the environment: essays on livelihood, dwelling and skill*: Psychology Press.

- Intergovernmental Panel on Climate Change. (2013). *Climate change 2013: the physical science basis: Working Group I contribution to the Fifth assessment report of the Intergovernmental Panel on Climate Change* (110705799X). Stocker, T.F., D. Qin, G. K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.) Retrieved from Cambridge University, United Kingdom and New York, NY, USA. doi:10.1017/CBO9781107415324
- International Panel on Climate Change. (2018). Global Warming of 1.5°C. <https://www.ipcc.ch/sr15/>.
- Kench, P. S., Ford, M. R., & Owen, S.D. (2018) Patterns of island change and persistence offer alternate adaptation pathways for atoll nations. *Nature Communications* 9:605
- Kelman, I., Orłowska, J., Upadhyay, H., Stojanov, R., Webersik, C., Simonelli, A. C., Procházka, D. & Němecet, D. (2019) Does climate change influence people's migration decisions in Maldives?. *Climatic Change* 153, 285–299. <https://doi.org/10.1007/s10584-019-02376-y>
- Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239-260. doi:10.1080/13504620220145401
- Lata, S., & Nunn, P. (2012). Misperceptions of climate-change risk as barriers to climate change adaptation: a case study from the Rewa Delta, Fiji. *Climatic Change*, 110(1), 169-186. doi:10.1007/s10584-011-0062-4
- Lazarus, R. S. (1993). Coping theory and research: Past, present, and future. Fifty years of the research and theory of RS Lazarus: An analysis of historical and perennial issues, 366-388.
- Lee, T. M., Markowitz, E. M., Howe, P. D., Ko, C.-Y., & Leiserowitz, A. A. (2015). Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change*, 5, 1014. doi:10.1038/nclimate2728
- May, J. F. (2016). *Maldives' Population Dynamics: Policy Prospects for Human Growth and Opportunity*. Retrieved from Maldives: <http://statisticsmaldives.gov.mv/nbs/wpcontent/uploads/2016/07/Population-Dynamics-Report.pdf>.
- McDonald, R. I., Chai, H. Y., & Newell, B. R. (2015). Personal experience and the 'psychological distance' of climate change: An integrative review. *Journal of Environmental Psychology*, 44 (Supplement C),109-118. doi: <https://doi.org/10.1016/j.jenvp.2015.10.003>
- Ministry of Environment and Energy. (2016). *Maldives Climate Change Policy Framework*. Male', Maldives: Ministry of Environment and Energy.
- Ministry of Finance and Treasury. (2017). *Statistical Pocket Book of Maldives [online] (2016)*. Maldives: Ministry of Finance and Treasury Retrieved from [statisticsmaldives.gov.mv/nbs/wpcontent/uploads/2017/01/Statistical-Pocketbook-2016-final-10-Jan-2016.pdf](http://statisticsmaldives.gov.mv/nbs/wpcontent/uploads/2017/01/Statistical-Pocketbook-2016-final-10-Jan-2016.pdf).
- Mortreux, C., & Barnett, J. (2017). Adaptive capacity: exploring the research frontier. *Wiley Interdisciplinary Reviews: Climate Change*, 8(4), n/a-n/a. doi:10.1002/wcc.467
- Moser, C., & Stein, A. (2011). Implementing urban participatory climate change adaptation appraisals: a methodological guideline. *Environment and Urbanization*, 23(2), 463-485. doi:10.1177/0956247811418739
- National Bureau of Statistics. (2019). Statistical Yearbook of Maldives 2019. <http://statisticsmaldives.gov.mv/yearbook/2019/>
- Neeraj, V., & Robert, E. R. (2001). Climate change in the Western Himalayas of India: a study of local perception and response. *Climate Research*, 19(2), 109-117.



- Pearson, A. R., Schuldt, J. P., & Romero-Canyas, R. (2016). Social climate science: A new vista for psychological science. *Perspectives on Psychological Science*, 11(5), 632-650. doi:10.1177/1745691616639726
- Pidgeon, N., Kasperson, R. E., & Slovic, P. (2003). *The social amplification of risk*: Cambridge University Press.
- Reser, J. P., Bradley, G., Glendon, A., Ellul, M. C., & Callaghan, R. (2012). *Public risk perceptions, understandings, and responses to climate change and natural disasters in Australia, 2010 and 2011*. Retrieved from Gold Coast: [https://www.nccarf.edu.au/sites/default/files/attached\\_files\\_publications/Reser\\_2012\\_Public\\_risk\\_perceptions\\_Second\\_survey\\_report.pdf](https://www.nccarf.edu.au/sites/default/files/attached_files_publications/Reser_2012_Public_risk_perceptions_Second_survey_report.pdf)
- Reser, J. P., & Swim, J. K. (2011). Adapting to and coping with the threat and impacts of climate change. *American Psychologist*, 66(4), 277-289. doi:http://dx.doi.org/10.1037/a0023412
- Schwarz, A.-M., Béné, C., Bennett, G., Boso, D., Hilly, Z., Paul, C., Posala, R., Sibiti, S., & Andrew, N. (2011). Vulnerability and resilience of remote rural communities to shocks and global changes: Empirical analysis from Solomon Islands. *Global Environmental Change*, 21(3), 1128-1140. doi:https://doi.org/10.1016/j.gloenvcha.2011.04.011
- Siegrist, J., & Marmot, M. (2004) Health Inequalities and the Psychosocial Environment—Two Scientific Challenges. *Social Science & Medicine*, 58, 1463-1473. http://dx.doi.org/10.1016/S0277-9536(03)00349-6
- Swim, J. K., Stern, P. C., Doherty, T. J., Clayton, S., Reser, J. P., Weber, E. U., Gifford, R., & Howard, G. S. (2011). Psychology's contributions to understanding and addressing global climate change. *American Psychologist*, 66(4), 241-250. doi:10.1037/a0023220
- Thomas, A., & Benjamin, L. (2017). Perceptions of climate change risk in The Bahamas. *Journal of Environmental Studies and Sciences*. doi:10.1007/s13412-017-0429-6
- Vannini, P. (2011). Constellations of ferry (im) mobility: islandness as the performance and politics of insulation and isolation. *Cultural Geographies*, 18(2), 249-271.
- Vannini, P., & Taggart, J. (2013). Doing islandness: a non-representational approach to an island's sense of place. *Cultural Geographies*, 20(2), 225-242. doi: http://dx.doi.org/10.1177/1474474011428098
- Vannini, P., Waskul, D., Gottschalk, S., & Ellis-Newstead, T. (2012). Making Sense of the Weather: Dwelling and Weathering on Canada's Rain Coast. *Space and Culture*, 15(4), 361-380. doi:10.1177/1206331211412269
- Vedwan, N. (2006). Culture, Climate and the Environment: Local Knowledge and Perception of Climate Change among Apple Growers in Northwestern India. *Journal of Ecological Anthropology*, 10(1), 4-18. doi:http://dx.doi.org/10.5038/2162-4593.10.1.1
- Warrick, O., Aalbersberg, W., Dumar, P., McNaught, R., & Teperman, K. (2017). The 'Pacific Adaptive Capacity Analysis Framework': guiding the assessment of adaptive capacity in Pacific island communities. *Regional Environmental Change*, 17(4), 1039-1051. doi:10.1007/s10113-016-1036-x
- Wolf, J., & Moser, S. C. (2011). Individual understandings, perceptions, and engagement with climate change: insights from in-depth studies across the world. *Wiley Interdisciplinary Reviews: Climate Change*, 2(4), 547-569.