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Local Perceptions of Climate Change Impacts in St. Kitts (Caribbean Sea) and Malé, Maldives (Indian Ocean)

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Abstract: Small Island Developing States (SIDS) are now experiencing the local consequences of a changing climate, environment, and society. Nonetheless, climate change research frequently remains at regional or national levels. Without locally grounded data, islanders' perceived impacts of the changes might not be considered, thereby causing difficulties when policy and practice responses are implemented without accounting for local understandings. To contribute to addressing this gap, this study examines perceptions of climate change and associated environmental and social changes in two SIDS case studies: St. Kitts in the Caribbean Sea and Malé Atoll, Maldives in the Indian Ocean. Through these two case studies, we assess perceptions of changing social and natural environments through a closed-question, face-to-face survey. Our results suggest that in both island case studies, communities perceive environmental changes to be happening that demand negotiation with the social changes of daily life. Results also suggest that perceived climate change impacts are only part of the equation, as social and economic impacts reveal two case studies of changing island societies. While the geographic context in each case study differs, this study reveals the perceived impacts of climate change and social changes at a local level, providing valuable insights and angles for formulating policies and actions to deal with the myriad of social and environmental changes affecting SIDS.

Keywords: small islands; local perceptions; environmental change; climate change

1. Introduction

1.1. Study Context

Climate change projections suggest sea-level rise, ocean acidification, coastal erosion, higher air and sea temperatures, and changing weather patterns and extremes, with impacts being felt now on, and expected to become worse for Small Island Developing States (SIDS) [1]. These climate change impacts do not and will not occur as isolated events, instead interacting with other social and environmental influences to affect positively and negatively the overall cultural, economic and political structures and processes of countries and communities [2]. SIDS find themselves increasingly in the spotlight, as they are frequently said to be amongst the locations most vulnerable to climate change and wider environmental changes [1]. Assumed island characteristics contributing to this vulnerability and presumed to preclude tackling it include scarce land resources, global economic shifts, colonial and post-colonial legacies, and inadequate governance [3–6].

This generalized perception of SIDS conveys one side of the situation. While changing environments and social challenges have always been part of SIDS life, and will continue to be so in the future, especially under contemporary climate change, island communities represent myriads of environmental and social contexts supporting and impeding life and livelihoods [7,8]. The doomsday myth of low-lying SIDS communities inevitably disappearing under climate change, perpetuated by popular media [9,10], has also been refuted by empirical evidence [11–13], yet a considerable gap remains in understanding local climate change impacts as well as the associated everyday concerns and perceptions of local communities regarding environmental change. While SIDS peoples have vulnerabilities to climate change, they also have ways of dealing with the challenges, so it is important to acknowledge, understand, and apply the wealth and variety of knowledge and wisdom across SIDS cultures and experiences [14].

That is, SIDS are not just about vulnerability, an approach which simplifies islander experiences and perceptions [15–18]. SIDS peoples also have strong interests and abilities in dealing with their vulnerabilities, tackling climate change, addressing climate change impacts, and trying to continue their island life in the face of these [19–21]. SIDS, including the two locations studied here as described later, display a balance of vulnerabilities to and capabilities for addressing climate change [22–28]. In such investigations, local voices require much more prominence, especially to understand how to develop and implement effective policies [14].

Many studies have examined climate change dimensions on SIDS, indicating that differences can arise amongst physical observations, external perceptions, and islander perceptions, with the latter generally receiving the least attention [29–31]. Yet SIDS peoples, having experienced millennia of social and environmental changes, proffer a wealth of knowledge and understanding regarding contemporary circumstances, especially as framed through their perceptions which should interact with and inform wider cohorts and those seeking possibilities for policies and actions [7,21,32,33]. Without attention to local perceptions, gaps in research, methodology and implementation of local responses to climate change will prevail for [25,34,35]. This is especially the case since so few studies consider more than one SIDS region, despite the opportunities available for SIDS to learn from each other, which was an ethos behind setting up and maintaining the SIDS grouping [36].

To contribute towards filling in this gap in order to enhance the applicability and local relevance of climate change related policy and practice, this paper offers different sets of perceptions on the impacts of climate and other changes from two island locations: St. Kitts in the Caribbean Sea and Malé, Maldives in the Indian Ocean (Figure 1). With insights from two different SIDS regions, we reveal that the complexities of islanders' lives must include attention to not only perceived climate change impacts, but also to perceived societal pressures.

First, we examine each island's contexts through their geographical and historical backgrounds. Then, we provide this study's methods, results, and interpretations. Next, we discuss the similarities and differences in the two locations that arise from our research results, concluding with the policy and research implications.

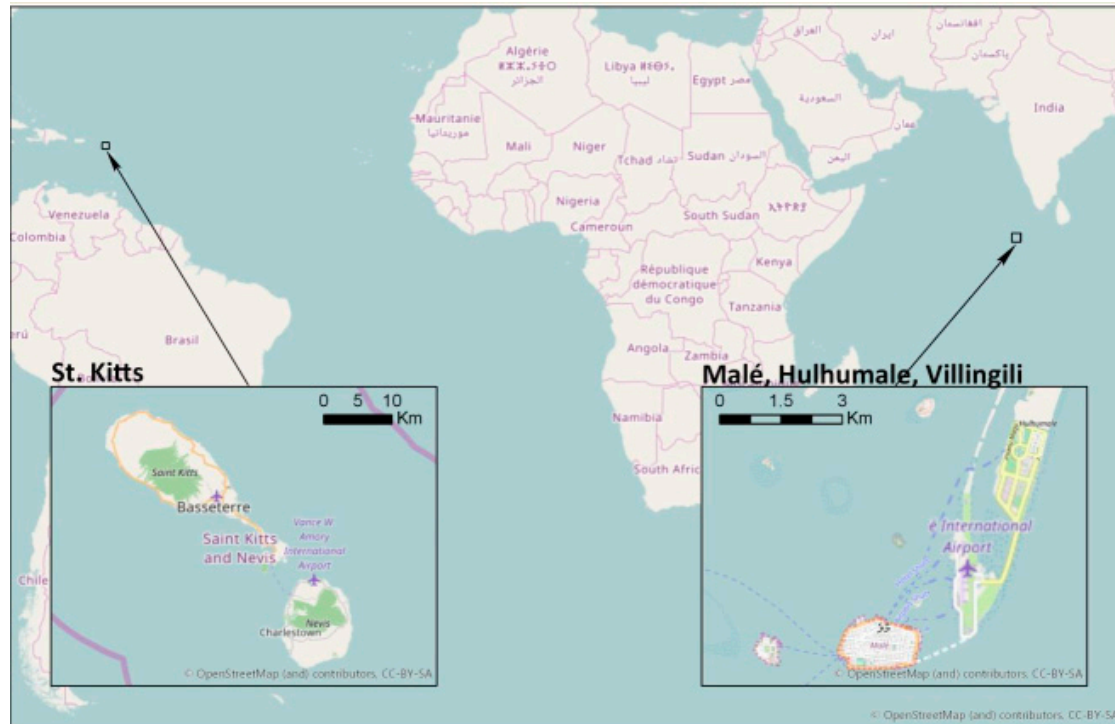


Figure 1. The locations of St. Kitts and Malé, Maldives.

1.2. *St. Kitts and Malé*

St. Kitts, one of the two main islands of the sovereign state of St. Kitts and Nevis (Figure 1), is found in the Lesser Antilles of the Eastern Caribbean. St. Kitts is 37 km long and 8 km wide with a total area of 176 km² and around 45,000 inhabitants [37,38]. With a humid, tropical, maritime climate and a mean temperature of around 27 °C, the island, while rugged, has fertile soils. With north-eastern winds, the island often experiences oceanic cyclonic movements [39].

Originally settled by Kalinago Amerindians moving northward from South America, these first settlers have been almost eradicated due to the violent European colonization of St. Kitts and the Caribbean region as a whole [40]. After British colonization, St. Kitts did become one of the best examples of the British sugar empire, as it proved to be an ideal location for mono-agriculture, thanks to its fertile soils and relatively flat landscape, becoming one of the most profitable British colonies [41,42].

Three centuries of slave-driven sugar cultivation on 90% of St. Kitts' arable land has left a legacy of a violent history, years of land degradation, and societal divisions. As profit was key, any wealth acquired from producing sugar was rarely invested back into St. Kitts towards stimulating development, infrastructure or livelihood diversification for its inhabitants. The consequences of slavery deeply affected the social hierarchy of the colony because a small group of affluent white landowners found themselves co-residing on a small island with a large population of skilled, enslaved peoples. Shaping the island's development and social structure, the historic land use resulted in limited land access and land ownership for local islanders, as villages were founded only in areas where sugarcane could not grow. Even after independence in 1983, St. Kitts continued to export sugarcane, despite declining yields and increased international competition.

The sugarcane industry finally ended in 2006, but land redistribution has not occurred. The defunct fields that occupy a majority of the island's fertile land have become overgrown,

blocking local access to traditional agricultural plots located in the mountains. Without access to land, historically impoverished rural settlements continue to depend on food imports, an incomprehensible dilemma considering the amount of arable land laying unused [43,44].

Significant tourism started to develop during the 1980s, but the transition was difficult without major capital for initial investments. The tourism industry contributed 25% of the island's total Gross Domestic Product (GDP) in 2015, employing 6.6% of the population [45]. The similarities between the dependencies created during monoculture cultivation of sugarcane and the current tourism industry are undeniable. Tourism is an unreliable and unpredictable market, depending on mainly external forces and resulting in the concentration of economic return in the hands of few, especially in certain coastline areas, with a minimal trickle down of positive impacts to local villages.

Sugar production, combined with subsequent land degradation and a tourism-focused economy has led to the depletion of natural and agricultural diversity as well as little progress in establishing a middle class [43]. In St. Kitts, therefore, the historical ecological deterioration of the land continues today, as local islanders and land continue to be separated [46,47].

Maldives (Figure 1) comprises an archipelago of about 1,190 islands south of India, grouped into 26 low-lying coral atolls. Around 200 islands are inhabited and about 80 more are used as tourist resorts. The land area totals 298 km², with no island larger than 10 km². Human migration has played a key role in the history of Maldives. Sitting at the centre of historical trade routes from China to Arabia and Africa [48], Maldives has been settled by diverse groups of people, beginning with the Aryans from Gujarat, India, around 2500 years ago [49]. Following this migration, settlers included an ethnic mix of Indo-Aryan, Dravidian, Sinhalese, and Arabs. These historic origins explain the strong genetic link between Maldives and the Indian sub-continent [50]. Maldives was colonised by the Portuguese from 1557 until 1573. Afterwards, new alliances were made with a variety of European powers, including, first, the French, followed by the Dutch and then the British until Maldives' independence in 1965. Today's society is largely homogenous with the same language, religion, and ethnicity across almost all the archipelago [51].

Until the 1970s, Maldives' economy was rather isolated and was based on fishing, shipping and coconut cultivation. It has changed due to the advent of tourism, which has been stimulating new economic activities and investments. The economy still depends on tourism and fishing, meaning that together with low agricultural production, the country depends substantially on imports of goods and services and the economy exhibits large fluctuations. For example, while the economy grew by 19.6% in 2006, it dropped 3.6% in 2009 due to the global economic crisis and hence reduced tourist numbers. But in 2010, it again increased by 7.1%, then in 2013, economic growth was only 3.7% [52]. Recently, the Government of Maldives has developed new economic sectors, such as off-port shipping services, information technology and financial services in order to reduce Maldives' vulnerability to suddenly changing tourism demand [52].

In Maldives, about 10% of the land is currently used for agriculture or cultivation, 3% is forested, and 3% is pastures [53]. As over 80% of the country sits less than 1 metre above sea level, Maldives must continually address coastal erosion, sea-level rise, salinity intrusion and monsoons [24,54–60].

Human settlements in the islands, public institutions, and critical infrastructure are located close to the shoreline because everywhere in Maldives is close to the shoreline. Consequently, everyone in the country and all infrastructure would be affected by sea-level rise impacts, especially inundation, beach erosion, storm surges, and high waves. These potential difficulties from environmental changes couple with social changes leading to concerns such as high population density on many islands leading to overcrowding, lack of infrastructure, infrastructure-induced subsidence, lack of services, devastation of beach vegetation, and shoreline degradation. Different approaches have been used to try to address the issues, including individual voluntary migration, resettlement projects which were especially significant after the 26 December 2004 tsunami [61] and continuing land reclamation although the impacts of these projects on quality of life is disputed. Large land reclamation projects

are the artificial island of Hulhumalé (1.89 km² which is 100% reclaimed) and Malé (0.82 km² which is 41% reclaimed) with Shaig [62] describing more.

The area for this study consists of three neighbouring, densely populated islands: Malé; the interconnected islands of Hulhulé and Hulhumalé; and Villingili. These three islands typically act as one economic, social and population unit, with Malé being the country's capital. We will refer to only Malé, encompassing the three islands as a single unit.

While very different in region, physical geography, human geography, and historic context (Table 1), the case studies of St. Kitts and Malé experience similar climate change impacts such as intensifying storms, rising sea levels, ocean acidification, and higher air and ocean temperatures [63,64]. According to [1], a range of emission scenarios projects sea levels rising 0.3–1.0 m globally by 2100. This sea-level rise will impact both islands significantly due to their heavily populated coasts, dependence on tourism and sometimes coastal infrastructure with limited preparedness.

Table 1. The dependence of St. Kitts and Maldives on tourism and imported natural resources, goods and services [65].

Country	St. Kitts and Nevis		Maldives	
	1995	2015	1995	2015
Number of tourists (in thousands)	79	122	315	1234
International tourism, receipts (% of total exports)	53.2	39.8 (2013)	66.4	84.8
Imports of goods and services (% of GDP)	1994	2016	1994	2016
	51.6	60.8	79.2	89.0

2. Methodology

We investigated two main questions:

(1) How do islanders from St. Kitts and Malé perceive their changing social and natural environments?

(2) How do demographic variables, such as gender, age and occupation change perceptions of climate change and its associated impacts?

Both case studies implemented a closed question survey conducted face-to-face in English between the interviewer and respondent. This method ensures comprehension by respondents and facilitates obtaining additional responses, personal opinions, and other pertinent insights related to the questions. All respondents were guaranteed anonymity and confidentiality. Snowball sampling ensured a wider and varied sample population [66–68], which is appropriate for perceptions-related studies on climate change [69–71]. This sampling technique ensured credibility and legitimacy of the researcher in each location, fostering trust and supporting integration with respondents. All respondents were 18 years old or older.

For St. Kitts, the case study area consists of a 12 km² area west from the capital of Basseterre, starting from the village of Challengers and going to Fig Tree (Figure 2). While independent from each other, each village sits on the main coastal road in close proximity to the next. Based on an extensive local network established by the researcher on St. Kitts, this case study area was selected due to local interest in the research. A total of 174 households was surveyed in January–February 2014, April–June 2014, and February 2015. The respondent sample from Malé, as defined above (Figure 3), comprised 347 household questionnaires from February–November 2013.



Figure 2. The study area in St Kitts.

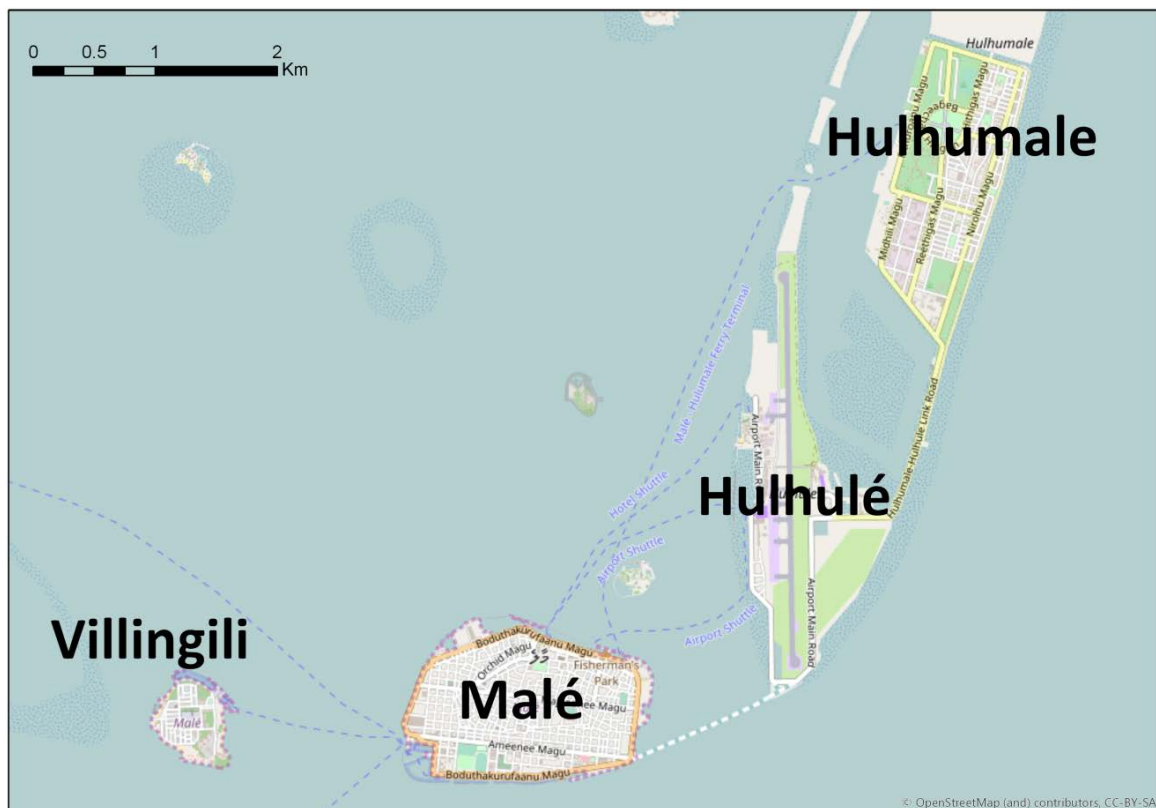


Figure 3. The study area around Malé.

In St. Kitts and Malé, the survey investigated each respondent’s own perceptions of environmental and social changes and the relationship of these perceptions with the respondent’s demographic variables. Implemented independently, these case studies highlight commonalities and differences rather than a pure comparison. Table 2 examines island and survey characteristics for each location. As each case study has a very different history, environment and current socio-economic situation, the methodology of each case study was adjusted in each place to ensure attention to local contexts and understandings. For example, wording of survey questions varied in each case study to ensure local relevance and applicability. Furthermore, during each interview, the researcher explained the usage of terms such as “climate change,” “impact” and “development” within the local context to ensure consistent understanding amongst individuals interviewed. Other, specific differences between each case study are discussed with the findings in Section 3.

Table 2. Island and survey characteristics.

Characteristic	St. Kitts	Malé
Island Characteristic		
Total Area (in km ²)	176	10
Number of inhabitants	45,000	163,000
Topography	Volcanic rock	Archipelago of 1190 islands grouped into 26 low-lying coral atolls
Highest elevation (metres)	1137	2.4
Colonial History	UK colony until 1983	UK colony until 1965
Survey Characteristics		
Time period	January–February 2014, May–June 2014, February 2015	February–November 2013
Total households surveyed	174	347
Gender of household member interviewed	Female: 84 (46.4%) Male: 90 (49.7%)	Female: 109 (31.4%) Male: 238 (68.6%)
Average Age	Age group: 31–40 years	Age group: 31–40 years

3. Findings

In both case studies, we find overall that respondents perceive environmental changes as occurring rapidly and as being negative. Respondents divulge that, along with environmental concerns, aspects of daily life, such as crime and poverty, are perceived to produce difficulties for local populations.

3.1. Perceptions of Environmental Change by Islanders

3.1.1. St. Kitts

Table 3 presents the specific number of individuals concerned versus those non-concerned with environmental or livelihood challenges. We also show the relative share that these individuals make up compared to the total number of respondents.

Table 3 reveals that respondents feel negatively overall about the changes they perceive to be happening. Concerning perceived climate change impacts on one’s village, 43.1% of respondents have a very negative perception. Sixty percent of the total 174 respondents indicated that coastal erosion impacts are very negative. Forty-two percent of people perceive sea level impacts on one’s village as very negative. Flooding impacts on one’s village vary by respondent, as 33.3% of survey respondents give a very positive impact on life, meaning that flooding is perceived as having no impact or no detrimental impact. However, 28.7% of respondents believe that flooding has a very negative impact. Therefore, flooding, overall, is not perceived as a current environmental detriment in the study area.

Responses concerning societal changes were given in free responses, so respondents could name specific elements that they felt most impacted their daily life. For this reason, there is no corresponding result for relative share of non-concerned survey respondents.

55.7% of survey respondents give construction and development as being a very negative perceived change on their life. When considering this aspect with the societal changes seen in the second part of Table 2, this may be related to a desire for more development in the study area.

Table 3. Respondents' perceptions of challenges in St. Kitts.

Indicator	Concerned Number of Respondents	Relative Share	Non-Concerned Number of Respondents	Relative Share
<i>Environmental Challenges</i>				
Climate change	75	43.1%	24	13.8%
Coastal erosion	105	60.0%	27	15.4%
Flooding changes	50	28.7%	58	33.3%
Sea Level changes	73	42.0%	20	11.5%
Infrastructure construction	97	55.7%	28	16.1%
<i>Other Changes-Free Response</i>				
Total societal changes	65	37.3%		
<i>Infrastructure</i>	31	17.8%		
<i>Higher crime rates</i>	24	13.8%		
<i>Lack of economic opportunity and poverty</i>	8	4.6%		
Total other environmental changes	39	22.4%		
<i>Hurricanes</i>	8	4.6%		
<i>Rodents/monkeys</i>	3	1.7%		

When answering what other types of changes are perceived by communities in the study area, 37.3% of the respondents cited societal changes as being one of the biggest concerns. This is further broken down into concern for infrastructure (17.8%), high crime rates (13.8%), and economic development (4.6%). 22.4% of respondents are concerned with other environmental factors, including hurricanes (4.6%) and rodents (1.7%).

Summarizing, the highest frequency of individuals perceive the coastal erosion impacts and climate change impacts as being the most negative in their experience. These results support perceptions of a changing shoreline, one that is severely eroding, potentially due to climate change through sea-level rise and flooding [72,73]. Besides the environmental concerns, individuals perceive distress regarding the lack of economic and social development in the area. Development or construction has not occurred at an acceptable level for respondents. Furthermore, the lack of economic development in the area has led to crime, poverty and declining community engagement.

3.1.2. Malé

Table 4 shows which perceptions of environmental and livelihood challenges in Malé are perceived more frequently by individuals. Individuals could mention more than one challenge. We reveal the relative share that these individuals make up compared to the total number of respondents.

This table reveals that 28.2% of all respondents in Malé perceive environmental challenges to be worrisome, such as lack of space for living and population growth (15.3%), climate variability (5.5%), dry weather and water shortages (3.7%), and impacts of sea-level rise and soil erosion (7.2%).

In the context of climate variability and weather changes, 71.2% of respondents in Malé had perceived some shifts and changes in weather patterns within the past 10–15 years. Just 8.1% had not observed any changes, while the remainder did not answer the question. 53.3% perceived summer monsoons to be hotter today against 12.4% of respondents thinking that summer monsoons are colder. 30.6% perceived them to be coming sooner, while 18.4% perceived them to be coming later. Meanwhile, winter monsoons were perceived as being hotter (47.6%) with less rain (37.8%) and being colder (11.5%) with more rain (17.9%).

The perception of other future livelihood challenges as being serious included job availability (10.4%), higher crime rates (3.8%), political instability and conflicts (4.6%), and low quality of healthcare and education (4.0%).

Table 4. Respondents' perceptions of challenges in Malé.

Challenge	Number of Respondents	Relative Share
Environmental challenges	98	28.2%
Lack of space and population growth	53	15.3%
Climate change	30	8.6%
Climate variability	19	5.5%
Dry weather and water shortages	13	3.7%
Sea-level rise and soil erosion	25	7.2%
Other challenges	92	26.5%
Job availability	36	10.4%
Higher crime rates	13	3.8%
Political instability	16	4.6%
Low quality of healthcare and education	14	4.0%

Note. Relative shares are expressed as ratios to all (347) respondents. The main aggregated groups are highlighted in bold. The shares of individual challenges (subgroups) do not necessarily sum up to the share of the main group because the respondent could have mentioned more than one challenge.

3.2. The Relationship Between age, Gender, Location, and Occupation and Environmental Change

3.2.1. St. Kitts

To explore how the perception of environmental impacts varies across demographics, we compared the environmental variables from Table 3 with age, gender and occupation. We do not consider the answers to the free response variables of other challenges. In Table 5, we present the relative share of the total of concerned versus non-concerned respondents compared to the total number of respondents in that age group. Because the age groups varied in size, we compare responses with relative share rather than with the number of respondents.

Overall, respondents from all age groups feel mainly negatively or concerned about environmental changes or other changes impacting their life. Individuals in all age groups are most concerned about coastal erosion and climate change impacts. It appears that all age groups are least concerned with the impacts of flooding. Development presents interesting results, as age groups 15–20 and 41–50 are most concerned with development. These individuals might wish to see more development in the study area.

Next, we compare gender with concerned versus non-concerned respondents for environmental variables (Table 6). Both male and female respondents express significant concern about the changing environmental factors, but in every category except for climate change, a higher percentage of women than men express concern. Overall, these results reveal that gender influences how changes in the environment and their effects are perceived, with a higher proportion of women than men tending to be concerned.

Investigating the relationship between occupation and perceptions of environmental changes presented few significant differences. Of the professions (agriculture/fishing, government, tourism, education, professional services, commercial/retail, tradesperson, home keeper, retired, other), 89.0% of respondents in the agriculture/fishing profession perceive climate change as being a high concern. Similarly, 84.0% of respondents in the agriculture/fishing profession perceive sea levels as being a high concern. The respondents of agriculture/fishing occupations happen to be all men in this case study.

Table 5. Perceptions of environmental and social challenges by age group: St. Kitts.

Age Group		Relative Share of Individuals in Each Age Group		
Age Group	Concerned about Climate Change	Not concerned about Climate Change	Concerned about Coastal Erosion	Not concerned about Coastal Erosion
15–20	75.4%	8.8%	86.0%	5.2%
21–30	81.3%	12.5%	87.5%	12.5%
31–40	76.5%	11.8%	73.5%	17.6%
41–50	68.2%	27.3%	86.4%	13.6%
51–60	78.1%	15.6%	71.9%	21.9%
61–above	69.2%	0	76.9%	7.7%

Age Group		Relative Share of Individuals in Each Age Group		
Age Group	Concerned about Flooding	Not Concerned about Flooding	Concerned about Sea Levels	Not Concerned about Sea Levels
15–20	49.1%	5.3%	61.4%	5.3%
21–30	56.3%	18.8%	56.3%	31.3%
31–40	50%	8.8%	70.6%	11.8%
41–50	45.5%	13.6%	63.6%	18.2%
51–60	43.8%	09.4%	65.6%	18.8%
61–above	61.5%	7.7%	53.8%	7.7%

Age Group		Relative Share of Individuals in Each Age Group		
Age Group	Concerned about Development	Not Concerned about Development		
15–20	63.2%	21.1%		
21–30	18.8%	50%		
31–40	41.2%	35.3%		
41–50	63.6%	22.7%		
51–60	37.5%	43.8%		
61–above	30.8%	38.5%		

Table 6. Perceptions of environmental and social challenges by gender: St. Kitts.

Gender		Relative Share of Each Gender		
Gender	Concerned about Climate Change	Not Concerned about Climate Change	Concerned about Coastal Erosion	Not Concerned about Coastal Erosion
Male	76.2%	10.7%	76.2%	16.7%
Female	74.4%	14.4%	84.4%	8.9%

Gender		Relative Share of Each Gender		
Gender	Concerned about Flooding	Not Concerned about Flooding	Concerned about Sea Levels	Not Concerned about Sea Levels
Male	45.2%	14.3%	58.3%	19.0%
Female	53.3%	4.4%	66.7%	7.8%

Gender		Relative Share of Each Gender		
Gender	Concerned about Development	Not Concerned about Development		
Male	39.3%	36.9%		
Female	44.4%	27.8%		

3.2.2. Malé

To investigate demographic variables (gender, age and occupation) and perceptions of environmental changes in Malé, specific environmental variables were aggregated together to express (1) the perception of environmental challenges in the future, (2) prior experience with environmental challenges in the last 15 years, and (3) the subjective evaluation of respondents’ overall environmental living conditions. We analysed the first two relationships using two binary indicators (variables based

on questions investigating environmental change perceptions where only “yes” or “no” outcomes were possible) and one categorical indicator (i.e., an ordinal variable expressing the subjective evaluation of environmental conditions). The third relationship evaluates respondents’ environmental living conditions on a scale from 1 to 5, where the value of 1 means that the environmental conditions are satisfactory and the respondents do not perceive them as being serious, while the value of 5 means that these conditions are very poor and dangerous.

To reveal the dependence of these indicators of environmental perceptions on demographic and social characteristics of the respondents from Malé, a standard logit model was used for the binary variables and a standard linear regression model was used for the categorical variable [74]. Since linear regression models are used for investigating the relationships between the continuous dependent variable and corresponding control variables, logistic regression reveals the overall effect of selected control variables on the categorical (binary) dependent variable [75,76].

Table 7 presents the factors that may be considered as being statistically significant at a 10% level of significance.

Table 7. Influence of socio-demographic factors on perceptions of environmental changes, Malé.

Indicator	Type	Significant Factors	Influence	Quality
Environmental Challenges	binary	Gender (male)	negative	0.62
		Age above 60	negative	
		Employment-unemployed	negative	
Perception of Weather Changes	binary	Age 25–29	positive	0.60
		Age 18–24	positive	
		Employment–services	negative	
Environmental Conditions	categorical	Age 18–24	positive	0.06
		Employment-retired	negative	

The influence of significant factors is based on the signs of the estimated coefficients at the corresponding variables. As for the binary dependent variables, the quality of the logit model is expressed by the means of the Receiver Operating Characteristic (ROC) curve, where values greater than 0.5 mean that the model is better than a random model. In the case of the linear regression model for the categorical variable, a usual R-squared is used to evaluate the model quality.

Our results suggest that Maldivian respondents’ gender, age and occupation play important roles in influencing the perceptions of environmental changes. Females and people over 60 years old perceive environmental changes as being a challenge in the future more than males and other age groups. Individuals engaged in the service sector observed fewer weather changes than any other occupational group. Unemployed respondents are less worried by environmental challenges in comparison with employed or retired respondents. Important weather changes are more likely to be mentioned by younger people, especially in the age groups 18–24 and 25–29. While the age group 18–24 evaluates environmental conditions more critically, retired respondents have more optimistic views and perceptions of environmental conditions.

4. Discussion

The findings present perceptions of climate change and other changes in the two case study locations in different SIDS regions. This study does not seek to be comparative, but rather offers different viewpoints from individuals living on the islands of St. Kitts and Malé.

Results in both places support the view that the cultural space of the island exists beyond land, into the ocean and its resources. Paramount for understanding islander identities and perceptions of environmental change, the importance of the coasts and seas for island populations has been noted

throughout past and current island communities [7,20,21,32,33,77], including the strong interactions between and assemblages of land and sea expressed through the blurring of boundaries [78] and the construct of aquapelagoes [79]. When we examine such topics at finer scales, this study exposes the subtleties of experience within islander populations, demonstrated by breaking down island populations by age, occupation and gender [80].

In St. Kitts, respondents perceive negative impacts occurring on their quality of life from climate change and related environmental change. Coastal erosion appears to be perceived as most concerning. While coastal erosion relates to a variety of factors, including but not limited to sea-level rise, the tangible and visible impacts of coastal erosion may concern Kittitians more during daily encounters with the sea and beach areas [81,82]. Whereas Kittitians perceive coastal erosion to be the most significant impact of environmental change, in Malé, respondents identify sea-level rise, population growth and climate variability as most significant. Again, this finding further supports literature on the importance of the sea for past and present island livelihoods and cultures [83,84].

In Malé, unlike St. Kitts, environmental impacts remain one of the three main driving forces behind migration patterns, especially in respondents with higher levels of education, namely with college diplomas or university degrees [85]. Similar to other literature, our results from Malé show that migration of island populations persists as a main characteristic of island life [50,86,87]. The normality of migration might indicate why Maldivians do not appear to be overly concerned about the potential migration consequences of climate change. While no inevitability exists of island disappearance under sea-level rise [11–13], SIDS' habitability could nonetheless be compromised, such as through changes to ecosystems or freshwater availability [88]. Migration by choice as an islander characteristic does not justify forced migration due to reasons beyond islanders' control. Further investigation would help to understand how much of the lack of concern of climate change-related migration emerges from factors such as flexibility, apathy, lack of worry about moving, ignorance, or strong interest in moving.

In both locations, respondents aged 18–29 are more sensitive to perceived weather changes and perceived changes to environmental conditions than other age groups. This may be due to increased knowledge of the subject as education has evolved, as well as concern for their families and future, given numerous discourses of islands being ruined by climate change (e.g., as analysed by Farbotko [9,10]). An alternative explanation could be that older people have experienced so many changes of different forms that the ongoing changes witnessed do not seem abnormal or unusual, but simply exactly what has always been experienced: the constant of change. If this is the case, then it brings a danger of complacency. For instance, one factor in some elderly people failing to evacuate from Louisiana before Hurricane Katrina's landfall in 2005 was their prior experiences of hurricanes; they survived previous big ones, so they assumed that Katrina would be no different [89]. With older Maldivians having witnessed numerous social and environmental changes to their country over the decades, they might be implicitly assuming that projected climate change impacts would be no different. Meanwhile, younger people not having experienced slow trends over decades, but with formal education and with the sudden upheaval of the 2004 tsunami in their minds, might be amplifying their perceptions of what climate change could bring.

The overall finding that women tend to be somewhat more concerned about environmental topics than men matches previous findings in the literature [90–92]. Here, St. Kitts reveals similar results, except in the variable of climate change for which the findings suggest that men feel more concerned than women. The explanation is in the other demographic factors. The results of the relationship of occupation to environmental factors show that only the occupational group of agricultural/fishing has a relationship to environmental variables. These respondents expressed high concern for climate change and sea-level rise; however, these respondents happen to be all male. Therefore, while women express more concern than men for most environmental factors, except climate change, the results taken as a whole suggest that an occupational bias rather than a gender bias has led to the higher proportion of men expressing concern for climate change.

In both places, both women and men are involved in fishing activities, although the majority of fishers are men, leading to the result here that all respondents involved in fishing, especially those naming it as an occupation, were male. Hence, the gendered term ‘fishermen’ applies here for emphasising that fishers’ point of views are male and that these men perceived climate change to be worthy of a high level of concern. In St. Kitts and Malé, fishermen, in particular those from 30 to 60 years old, perceived the most environmental impacts and are most worried about them. Such a result matches previous work, such as Pugh [93] in Barbados, indicating how livelihood experiences lead to perceptions of climate change alongside concerns about its potential impacts. In both Malé and St. Kitts, the fishermen’s dependence on ocean resources led to stronger perceived climate change impacts, as also found in other literature [33,94–96].

With work conditions involving day-to-day interaction with the environment and a nature-dependent livelihood, these results further support previous work indicating strong sensitivity of individuals working in agriculture or fishing to perceptions of climatic and environmental changes [97–100]. Further implications emerge from these gendered occupational roles. The absence of women in agricultural and fishing careers means that they miss the opportunity to be more aware of any environmental changes, the implications of which require further detailed explorations (e.g., using suggestions from MacGregor [101]). This situation could disadvantage women in decision-making because they do not directly experience in detail the environment around them. Conversely, this situation might provide advantageous for women in decision-making because, if they are given and take the opportunity to glean information from elsewhere, then they could compare and contrast different sources—including the men’s perceptions—rather than relying on only their daily experience (but also see analysis for South Asia by Sultana [102]).

Results from both locations reveal that while perceptions of environmental impacts cause concern, many actually feel more negatively about the changing society and lack of opportunities. Kittitians report perceptions of a society changing for the worse, encountering increased crime, poverty and lack of social development. People in Malé also perceive environmental challenges as less important compared to the economic situation and social problems. Considering the historical background and current economic dependence on tourism of both islands, this result exposes the lasting marginalization and idealized “paradise” of small [7,100,103–105]. Tackling climate change impacts on small islands must be done in conjunction with research on the changing social and economic fabric of island case studies [106–108]. Deeper issues such as corruption, discrimination, extortion, and political intimidation [109,110] could be explicitly explored, as respondents might not wished to have raised these topics or might not have recognized these topics as being important, instead presuming them to be typical expressions of everyday life. Policy makers need to be aware that expressed perceptions do not necessarily encompass all issues of concern whilst fundamental causes of acknowledged vulnerabilities to climate change might not always be directly identified or identifiable, especially if climate change is promoted as being the most important topic.

These results and discussions emerge from and match plenty of work from development studies which has not been fully embraced in climate change research, policy, or action, thereby indicating possible room for improvement within climate change realms. Expressions of “silent violence” [111] against people have long been part of development research and action agendas, including because the people realize that this form of violence inhibited them from dealing with disasters and adverse impacts of environmental changes—or perceptions thereof. More recently [112] edited a special journal issue covering the “risky everyday”, demonstrating how people often resist measures to deal with disaster risk, encompassing perceived risk related to climate change, because they have far greater daily risks with which to contend, including crime, economic instability, corruption, pollution, job safety and security, and street violence. Practitioner and grassroots viewpoints match these concerns and approaches to local responses to [113,114].

Policy making for climate change action on SIDS needs to apply these lessons. First, policies need to start with the people by listening to their concerns, synthesising their viewpoints, working through any disagreements amongst or apparent misapprehensions from all parties involved, and formulating

policies and communication approaches which directly address people's concerns [115]. These tasks must be formulated and executed within the known power relations inherent in consultation and participation processes [116] as well as the explanations of how to aim to accept and deal with them [117] since they are impossible to escape entirely.

Second, climate change is not necessarily perceived to be the biggest or only concern which SIDS peoples consider. Sometimes, climate change is not perceived to be a concern at all, even for perceptions of environmental changes or migration-related or livelihoods-related decisions. Even if external perceptions suggest or advocate otherwise, effective action on climate change is not likely to be feasible without framing it according to the people's viewpoints.

Third, working with local leaders or gatekeepers (such as chiefs, religious leaders, economic leaders, and politicians) to understand suitable messages and means of messaging can be effective in reaching large swathes of the population on the peoples' own terms [118,119]. It is nonetheless important to accept that these leaders do not necessarily represent the majority, or all community sectors, as the leaders are often complicit in ignoring and repressing the majority or minorities, so they frequently support policies which pursue and enhance their own interests, irrespective of the implications for others [118–120]. As is well-accepted in any context, island locations are no different in having diversity and diverse perceptions within the population, leading to a lack of homogeneity within the community being studied [121–123]. The policy lessons from the research here are clear that climate change action on SIDS is not necessarily easier (or even necessarily different) in smaller, more bounded land environments. The same challenges, which are present in larger locations recur, although always with local contextualisation.

5. Conclusions

To investigate islanders' perceptions of climate change impacts and wider changes, this paper explored the two case studies of St. Kitts and Malé. It contributes original data and analysis to the literature, particularly from the understudied location of St. Kitts, while providing new angles for Maldives, which assists in filling in the lacuna of evidence presented from locally grounded data involving perceptions (rather than actualities) of the islanders potentially directly affected by climate change impacts in the context of other changes. Policies and practices can therefore be more attuned to people's expectations and needs, with the potential for considering the relevance of influencing perceptions if specific viewpoints are found to differ substantially from what is actually happening.

Overall, we reveal that irrespective of any global indicators of climate change [1], including for SIDS, discerning relevant meaning for people potentially affected must involve local studies, aiming to understand not just what is actually happening locally but also what the people perceive to be happening. This conclusion draws extensively on development literature, further demonstrating the importance of climate change studies being placed in and learning from wider fields in order to draw on deeper and broader topics [124,125]. In particular, in the context of perceived environmental changes, islanders in both case studies demonstrate concern for broader social and economic ills, such as poverty, crime and joblessness. As islanders and island communities around the world have experienced climatic changes throughout past millennia [20], it is important contextualize them within pre-existing social and environmental conditions and trends, notably people's perceptions of them.

Consequently, climate change adaptation measures must be applied with consideration of local islander conceptualizations and perceptions of vulnerability and needs, not necessarily permitting either local or non-local approaches to dominate or dictate, but instead melding them [126]. Research must unpack climate change adaptation measures by investigating not only climate change and associated environmental impacts but also social and economic patterns alongside other concerns of the people affected.

Using only global indicators to explain island and islander vulnerabilities overlooks the reality of historic and present-day forces shaping islanders' perceptions and influencing their aspirations and livelihood decisions. Results from these two case studies highlight the importance of local

participation and local data to formulate policies that are likely to be implemented, especially given the diversity of SIDS, as well as the diversity within a single SIDS and within a single SIDS' island or community [121,122]. Fully embracing localisation, diversity at the local level, and perceptions of the people would substantially enhance current understandings of how to best address expected (or perceived) climate change impacts and how to best connect climate change and concerns about it to wider topics, including day-to-day life. In doing so, islanders could provide plenty of needed possible insights for the rest of the world.

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