

## Comparing tools and methodologies for climate change adaptation in Small Island Developing States [SIDS]

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Keywords: adaptation, SIDS, vulnerability, communities, ecosystems, qualitative fieldwork

This paper aims at producing a critical assessment of different tools and methodologies for climate change adaptation available to Small Island Developing States [SIDS] through comparing Community-based adaptation [CbA] and Ecosystem-based adaptation [EbA] initiatives in SIDS. Data emerge from qualitative fieldwork conducted in Tonga [South Pacific], Barbados [Caribbean Sea] and the Seychelles [Indian Ocean]. The analysis uses the fieldwork experience by examining the identification, design, implementation, and monitoring of specific CbA and EbA projects related to climate change to highlight key challenges in applying tools and the efforts required to overcome those challenges. Differences and similarities between the projects labeled as CbA and EbA are noted. A key recommendation which is implemented in this paper is connecting scales in terms of the meaning for the affected SIDS people of vulnerability and [community-based] adaptation, compared with views of national/regional NGOs and what happens at international level negotiations.

### *1. Introduction: Background to SIDS vulnerability and climate change*

The Small Island developing States [SIDS] are one of the most vulnerable areas in the world to the adverse impacts of climate change [1, 2]. The IPCC's 4<sup>th</sup> Assessment Report acknowledges that SIDS will experience at least a 0.18-0.59 m. sea level rise over the next 100 years and significant proportions of land will be inundated. Other major impacts of climate change might occur such as more frequent and intense extreme weather events, sea water intrusion in groundwater that leads to land erosion and freshwater shortages.

The vulnerability discourse has been discussed in the academia since the 1970s. Gaillard [3] provides an in – depth vulnerability literature review and claims that vulnerability in the Global South is more an issue of sustainable livelihoods management. However, recently the vulnerability discourse has been transferred from the academia to the international fora. The two mainstream definitions of vulnerability should be coined to UNISDR [4] and IPCC [2]. UNISDR [4] defines vulnerability as “the conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.” On the other hand IPCC [2] defines vulnerability as “the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its

sensitivity, and its adaptive capacity.” The main difference is that in UNISDR’s definition the focus is more on the underlying processes and factors, and therefore it complies with the relevant academic literature [e.g. 5,6,7] whereas IPCC [2] focus solely upon climate change. Kelman and West [8] successfully point out that IPCC should have also included bottom-up consultation to obtain local knowledge and meet SIDS’ residents’ needs in terms of more sustainable solutions. It is also acknowledged by Gaillard [3] that focus on climate change stimuli has been used by the developing countries as a scapegoat from the root causes of vulnerability to natural disasters. Gaillard [3] claims that marginalization (geographic, social, economic and political) is the crucial element of vulnerability instead. From the literature review it is concluded that SIDS are socially vulnerable; in most cases they are isolated areas with relatively small populations and limited domestic land-based resources. Their societies will face impacts of climate change and most possibly they will experience rapid rural-to-urban migration, potential loss of languages and cultures through migration and gender inequalities [9].

## *2. Climate change adaptation actions including CbA and EbA*

It is common knowledge that adapting to climate change without integrating traditional local knowledge might lead to failure and malpractices. The most recent literature on disaster risk reduction (DRR) and climate change adaptation (CCA) converge to that point; a more holistic approach should be adopted in terms enhancing the synergies between DRR and CCA and also combining scientific and local knowledge. The main constraints of implementing adaptation in the SIDS acknowledged by Mataka et al. [10]; climate change is a futurist threat and decisions might be postponed, low level of public awareness, weak socioeconomic conditions and lack of capacity.

Reid et al. [11] define community-based adaptation (CBA) as “a community-led process, based on communities priorities, needs, knowledge and capacities which should empower people to plan for and cope with the impacts of climate change”. Therefore, CBA focuses largely on supporting people to help themselves for CCA. Ecosystem-based adaptation (EbA) is an emerging approach that helps people adapt to the adverse impacts of climate change by using biodiversity and ecosystem services to their advantage [12, 13, 14]. EbA promotes sustainable management and conservation and restoration of ecosystems, taking into account anticipated climate change impacts, to increase the resilience of ecosystems and people to climate change impacts [15, 16].

CbA tools for climate change entered academic discourse only recently. However researchers from the scientific fields of DRR and climate change adaptation should be acknowledged for the qualitative turn in the CBA discourse [17]. CBA focuses largely on empowerment or “help people to help themselves” [18]. Kelman et al. [19] adopt the “guided discovery” framework as a four-step process that leads to the establishment of long-term cooperative partnerships between communities and collaborators outside the community at national, regional and international levels. Its main strength is that it recognizes scientific and local knowledge as resources for successful strategies to vulnerability reduction.

Thus, the main issue that CBA methodologies should be addressing is the possibility of integrating bottom-up and top-down activities. A major gap in the climate change science already acknowledged by Mercer [20] amongst others is that development practitioners can reject or be unaware of scientific knowledge while scientists that consider themselves experts often do not engage in practice. Thus the main challenge for CBA is to form a new discourse that will bring together local governments, communities, international organizations, researchers and NGOs.

Simultaneously international NGOs with experience in field activities concerning DRR conducted research on new tools for CBA activities. Furthermore, CBA toolkits were analyzed by international environmental NGOs within the context of EbA to climate change [see; 12;13]. EbA is a relatively new

approach that combines adaptation to climate change, sound ecosystem management and livelihood development. It is particularly promoted by international conservation NGOs such as the IUCN.

Perez et al. [13] define EbA as “an approach that builds resilience and reduces the vulnerability of local communities to climate change...EbA integrates sustainable use of biodiversity and ecosystem services in a comprehensive adaptation strategy”. Its main objectives are to promote community resilience through maintaining the ecosystem services, enacting climate change adaptation within disaster risk reduction and preventing mal-adaptation. IUCN has launched two CBA toolkits that focus more on ecosystem-based activities; the CRISTAL [with other agencies] and MESCAL toolkits. However it is acknowledged that they have not yet been implemented in the field. UNEP has implemented the RiVAMP methodology in a pilot project in Jamaica [21]. Marshall et al. [12] provide a synthesis of CBA toolkits. Kelman and Mercer [15] in their gap analysis for EbA in the Caribbean successfully point out that “EbA activities are often not differentiated from non-EbA activities, instead recognizing adaptation as happening or being needed, with some aspects involving or related to ecosystems and other aspects not.”

### *3. Description of field work and field method*

This paper aims at producing a critical assessment report on different tools and methodologies for climate based adaptation available to the SIDS. It will use the experience of Tonga, Barbados and the Seychelles in the identification, design, implementation and the monitoring of the community-based (CB) projects related to climate change to highlight key challenges in applying CB CCA tools, and what efforts would need to be made to effectively adopt and apply available CB CCA tools. The main goal is to provide an assessment of various adaptation tools available for SIDS quickly ground-truthed in various locations in all three SIDSs and to connect scales in terms of what vulnerability and community-based adaptation means to local communities as opposed to national/regional NGOs and at international level negotiations.

The fieldwork contributed to the triangulation of the theoretical data by observing, talking and interviewing members of civil society involved in relevant projects. Furthermore, interviews were also conducted with key officers who participate in the international climate change (and other thematic) negotiations processes, representing their community and national interests. Before the field trips, a semi-structured interview questionnaire was developed, listing about a dozen open-ended questions in order to guide discussions with different stakeholders. The interviews were recorded, with the consent of the interviewees and specific data from the interviewees was collected—age, gender, role from individuals and, from the NGOs, approximate size, mandate and location.

### *4. Fieldwork analysis*

#### *4.1 Tonga. Implementing CbA and EbA*

Tonga has a combined land and sea area of 720,000 km<sup>2</sup>, of which 717 km<sup>2</sup> is the land area. The country comprises approximately 172 named islands, of which 36 islands totaling 649 km<sup>2</sup> are inhabited. The country’s population is around 106,000 with almost 70% living on the main island, Tongatapu. The main livelihoods are agriculture and fishing, much of which is subsistence-based. These two sectors account for a quarter of Tonga’s annual GDP [22,23]. Remittances from

international sources can be up to 50% of a village's income and rarely fall under 15% for any village [24], with a country-wide average of about 39-40% of annual GDP [22,23]. Aid represents approximately 12% of Tonga's annual GDP [22]. Tourism also generates revenue, with direct and indirect income from travel and tourism providing 11.6% of Tonga's GDP and 11.9% of Tonga's total employment in 2010 [25].

From the locations visited during the fieldtrip in October 2010 it is evident that successful community-based EbA means linking ecosystems and local livelihood benefits. People are concerned about livelihoods. For instance, in Sopu and Popua, EbA was not feasible because giving people homes was the priority. In contrast, the examples from Ha'apai showed local buy-in when people understood how EbA would support their own livelihoods. Another key message is that showing community benefits from EbA creates local buy-in leading to behavioural change and sustainability. When community benefits from mangroves were shown (e.g. reduced storm damage and livelihoods support), people dumped less rubbish there. Locals saw that their livelihoods would gain from ecosystem restoration, so they did the work themselves. The youth were motivated because the revenues from EbA helped them improve their own livelihoods. EbA requires tackling recent, negative perceptions and attitudes regarding ecosystems such as mangroves. For better and more efficient implementation of EbA the involvement of the elders in explaining indigenous knowledge and ecosystem values led to attitude and behavioural change (e.g. reduced rubbish dumping in mangroves). The concept of learning by doing can enhance local EbA initiatives and traditional knowledge remains an important community asset, contributing to EbA. Involving the elders in community awareness-raising was successful and their participation ensured that local buy-in was increased by including traditional medicinal knowledge as part of the reason for selecting plants.



Photo [Stavros Mavrogenis]: former mangrove swamp in Popua.

Funding and capacity development are challenges for local civil society, so further support in those areas is needed. The local NGOs have neither the resources nor capacity to use information technology to the fullest extent needed. It is acknowledged that gender empowerment and equality is both a means and a consequence of successful EbA. In Tonga, EbA was supported through a women's empowerment project, which then motivated the women to continue EbA activities.

Lack of baseline and monitoring data, including demonstrating evidence of the effectiveness of EbA initiatives, along with lack of access to scientific information, such as appropriate selection of mangrove species, inhibits EbA decision-making with confidence. Evaluating the effectiveness of the

local work is not feasible due to lack of time series data. Also, evidence demonstrating and comparing the effectiveness between ecosystems and engineered infrastructure [e.g. sea wall] is lacking. Setting specific goals and targets is difficult due to lack of time series data.

#### *4.2 Barbados Tourism and urbanization as a hindrance to adaptation*

Barbados is the most easterly of the Caribbean islands, located at 13°N and 59°W, approximately 160 kilometres from the nearest landmass, against prevailing winds and currents. The island is 34 km long and 23 km wide with a total land area of approximately 432 km<sup>2</sup>, 92 km of coastline and an Exclusive Economic Zone (EEZ) of 167, 000 km<sup>2</sup> [26].

The geology of Barbados explains a lot of today's state of the environment [27]. Most of the island consists of gullies and a complex underground cave system that collect the rainwater and discharge into the sea at the west coast. There is little surface water on the island, with small surface streams found primarily in the Scotland District region of the island. The island is therefore almost completely dependent on groundwater abstracted from the aquifer underlying the island, aside from people purchasing bottled water. The other part of the country mainly in the Scotland district consists of the sedimentary deposits which are susceptible to erosion. Therefore, stricter housing regulations are applied to this area and also there is an ongoing discussion for announcing the Scotland District as an environmental park. Although Barbados lies just outside the recent path of most Atlantic hurricanes, 58 severe rainfall and wind events have been documented from 1955-2000 [28]. The last hurricane recorded to cause major damage was Hurricane Allen in 1980. More recently, Hurricane Dean in 2007 caused storm surge and minor damage.

The country faces two main pressures; tourism and urbanization. These two economic activities are the main source of national income but also the main factors for the degradation of the natural environment. Barbados has a long history of environmental mismanagement. Starting from the era of the first settlers that exercised extensive deforestation and cleared the island from forests in about 15 years [1627 – 1640] for sugar monoculture. As successfully put by Watson [29] by the 18<sup>th</sup> century the island was a well-cultivated garden. An explorer of his time Edward Thompson wrote that “this island looks like a Christian country than any other of the Caribees, every spot of it cultivated and cleared of the wood”. This notion of wilderness and nature is the source of modern Barbadian dislike of “bush” or natural foliage and their addiction to manicured lots. At the highest peak of the sugar cane production during the colonization era (or plantocracy) from the total area of 106.000 acres of arable land 30.000 acres were cultivated for sugar cane production, 30.000 for livestock and 30.000 for other agricultural products. During the 1980s with the so-called Tourism Revolution the cultivated garden was transformed to the manicured garden. The abandonment of the sugar plantations led to the rapid urbanization of the country and the creation of the Barbadian middle – class. Therefore urban sprawl to the former sugar cane plantations was a necessity in order to satisfy Barbadian's housing needs.



Photo [Stavros Mavrogenis]: a shopping cart in a drainage channel

From the fieldwork conducted it is concluded that EbA is not a priority for the Barbadian government. It is acknowledged from archaeological evidence that much of the south and west of Barbados was dotted with mangroves before the arrival of the settlers [30]. However most of the mangroves were chopped off by the settlers. In modern Barbadian history mangroves preservation was not a priority as well. The canalization of Constitution River led to the loss of the last significant mangrove area in the island. Today Barbados has the smallest area of surviving mangroves in the Caribbean. Also the expansion of the Bridgetown harbour destroyed the Indian River Swamp. Gullies are perhaps the last surviving ecosystem spots on the island. They face environmental degradation due to illegal dumping and during the past they were usually used as landfills by locals. There was an attempt of planting trees across their coastline but it failed as the locals did not respect the young trees and there was no proper maintenance by the government. The National Conservation Committee which is the responsible government unit focuses mostly upon selling seeds for lawns and gardens. Third, there is evident lack of a vibrant civil society and only a few of them are environmental NGOs. The Future Centre Trust which is formed by expatriates or white Barbadians is perhaps the most active but is viewed as an outsider and elitist. Other organizations such as the Caribbean Youth Environmental Network and the CARIBSAVE target their main activities to other countries in the Caribbean although they maintain their headquarters in Barbados. The reason is the proximity to the headquarters of other international organizations, the safe and stable political environment in Barbados, the weather conditions and the existence of infrastructure able to support their presence and activities.

Most of the communities in the Pacific area share a strong history of successful response to natural hazards since thousands of years and share a unique heritage and also creativity for sustainable livelihoods [see also Mercer 2010, Nunn et al. 2007, Gaillard 2007]. On the other hand in the Caribbean most of the communities are not indigenous but were relocated during the colonial times from West Africa. Therefore the absence of community spirit that is dominant in the South Pacific might be a hindrance for implementing CbA in the Caribbean. Therefore, environmental awareness is not high in Barbados for a number of reasons. First of all, it is the political system's liabilities something common in the SIDS; social fragmentation, clientelism and in the case of Barbados absence of local authorities. People are passive and depend a lot on their MPs for the improvement of their livelihoods. At the same time urbanization is the main cause for the significant erosion of community. As successfully put by Pelling [32] "rapid material development in Barbados has enabled the privatization of leisure time and a withdrawal from public space and community – based activities. Therefore CbA is not likely to take place unless local buy in is ensured.

#### 4.3 Seychelles. Enhancing institutional capacity for adaptation

The Seychelles are an archipelagic nation of Western Indian Ocean that is situated northwest of Madagascar and consists of over 115 islands and 455 km<sup>2</sup> of landmass. Mahe is the largest island where the highest altitude is at 905 meters above sea level. The majority of the islands are surrounded by coral reefs with an area of 1.690 km<sup>2</sup>. Like the vast majority of SIDS the majority of the population lives in the main island. In Mahe the population density is 434 inhabitants per km<sup>2</sup> in the capital Victoria whereas in the rest of island is 3000 residents per km<sup>2</sup>. The urbanization rate is 2,2 % per year. Seychelles in contrast to Barbados and Tonga is not a MIRAB (Migration, Remittances, Aid and Bureaucracy) economy but in the contrary it is a host country for immigrants. Tourism and fisheries are the main two sources of national income for Seychelles. In comparison to Barbados, Seychelles have not invested in the mass tourism model and on the contrary promote ecotourism as their main strategy. For that reason since August 2010 they have developed their own certificate for hotels and resorts “the Seychelles Brand” which is a set of standards that hotels and resorts should adopt in order for opening permission to be granted. One case-study worth mentioning is the Port Launay – Port Glaud mangrove area and the construction of Ephelia Resort nearby.

Originally the Port Launay-Port Glaud mangrove area was more extensive and surrounded by coastal woodland. In the 19th and 20th centuries, some areas were drained to provide more land for coconut plantations. There was gradual development of houses along the road next to the river and near the beaches. In the early 1980s one of the National Youth Service residential education ‘villages’ was located on the Port Launay plateau. The village was later abandoned and then replaced by the five-star Ephelia Resort, which opened in February 2010. The Port Launay Wetlands which are a RAMSAR site (Ramsar Site No. 1432 – ‘Port Launay coastal wetlands’) are jointly managed by the Constance Ephelia Resort, a five-star hotel that was opened adjacent to the wetlands in 2010, and the NGO “Sustainability for Seychelles” under an arrangement with the Seychelles National Parks Authority (SNPA) and the Seychelles Department of Environment, the official management authority for the site. The local buy-in ensured job opportunities were offered and the organization of field trips for hotel customers to the adjacent village. The Port Launay Wetlands provides an example of government-private sector-civil society and the local community in order to co-manage the wetland area.



Photo [Stavros Mavrogenis]: a sea wall made of causarina trees pillars in Mahe island, Seychelles

The government of Seychelles has demonstrated strong commitment to fighting climate change and in 1992 was the second country in the world to sign UNFCCC [33]. Two months later, the country established a national commission for coordinating, developing, and implementing a national plan on climate change, for acting as an intermediary between the national plan and the government, and for preparing national communications to the UNFCCC. The country's national strategy for climate change has the main goal of minimising climate change impacts through coordinated and preventative action at all levels of society—deliberately connecting the local, national, and international. The Seychelles' national adaptation strategy has already achieved institutional governance and community engagement through a series of open public consultations. Integrating top-down and bottom-up approaches has ensured progress on CCA despite the problems of funding, slow exchange of knowledge and technology, and continued marginalization of the SIDS.

### 5. Discussion and Conclusions

This paper has reviewed theory, practices and policies for EbA and CbA, triangulated with fieldtrips in three SIDS. The approach is linear, in terms of theory informing policy that in turn is transformed into action on the field. The table summarizes the factors that are essential for the successful implementation of adaptation in SIDS. All three countries are physically and socially vulnerable to climate extremes and disasters. Tonga due to its proximity to the Pacific Ring of Fire has to face geological hazards as well [earthquakes and tsunamis] and Barbados could also experience volcanic ash from nearby islands, plus the prospect of a major earthquake in the region.

<b>factors</b>	<b>Tonga</b>	<b>Barbados</b>	<b>Seychelles</b>
Vulnerability	high	Medium	Medium
Legislation	Inadequate	Sufficient/lack of implementation	Sufficient/well implemented`
Political institutions	Inadequate	Sufficient / framed by external factors	Well established
Climate adaptation policy	Inadequate	Update needed	Well designed and implemented
Economy	MIRAB economy	MIRAB Economy	Aid and bureaucracy
Tourism	Restricted	Massive	Ecotourism
Education	Basic / absence of environmental education	High / absence of environmental education	High / education for sustainable development
National identity	Pressure from globalization	Absence	Strong national and cultural identity



Table 1: factors that influence CCA in the three countries visited

Geographic isolation, lack of natural resources, distance from trade routes, monocultures and subsistence agricultural production are some of the causes of weak economies in SIDS that lead a significant proportion of their population to migrate. Their remittances often provide a substantial source of income for their kin members in homeland that combined with international aid support the basic functions of SIDS public finance. These funds are allocated by a local bureaucracy that draws its power from the process and usually its decisions are guided by the framework imposed by donors. The concept of MIRAB economies for small island states was popular during the 1980s [34,35]. However this theory has been criticized descriptively accurate for a subset of island economies and for the non-predictability about the growth of tourism in SIDS [36].

Tonga and Barbados for example are MIRAB economies with minor differences in the application of the model. For instance migrants from Barbados are a case of brain drain whereas migrants from Tonga are not. Seychelles on the contrary is a country that attracts immigrants from eastern Africa and South Asia. All three countries seek international aid from donor countries and organizations bureaucracy is an important factor for all three countries that is in charge of the allocation of international aid funds and for implementing national policies. The role of local bureaucracies leads to a critical approach of local political institutions in terms of their effectiveness and accountability.

The weak political institutions in Tonga are a hindrance for the sound implementation of CbA and EbA measures as shown in the case of Popua where consolidation of population from the outer islands was promoted instead of the preservation of the mangrove swamp area. In Barbados the over-dependence of local economy to mass tourism model has prioritized in many occasions big investments in resorts development against adaptation measures. In Seychelles political institutions are more accountable and decisions are taken after consultations with local population. The combination of local participation, open democratic institutions and modern environmental legislation are the three pillars of a successful adaptation strategy in Seychelles. Tourism activities in Tonga are restricted to outer islands and not a potential source of income for locals. Seychelles have already adopted strict environmental standards and promote ecotouristic activities. Both Barbados and Seychelles offer university education to their citizens but only in Seychelles there are environmental education courses in elementary and high schools. There is no university education in Tonga and no provision for environmental courses in elementary schools. National identity and culture are crucial elements of the risk perception in each society. All three countries have colonial past with Barbados and Seychelles being colonized and settled in the 18<sup>th</sup> century. In Tonga the tribal regime with chieftains and the King remained stable and was enhanced with more privileges by the missionaries who drafted the constitution and the legislation that are in action until today. The major breakthrough took place in the Seychelles with the strategic decision of the government in the mid-70s about the promotion of the Creole culture as the basis of a new national identity [37,38]. A strong national identity is essential for the social capital in a country and for the development of a cooperation culture in which consensus is a sine qua non term for the successful implementation of CCA policies and measures.

#### Reference list

1. M. Pelling, and J.I. Uitto, Small Island Developing States: Natural Disaster Vulnerability and Global Change, *Environmental Hazards* 3: (2001) 49-62.
2. IPCC, Fourth Assessment Report. IPCC, Geneva, 2007.
3. J.C. Gaillard, Vulnerability, Capacity and Resilience: Perspectives for Climate and Development Policy, *Journal of International development* 22 (2010) 218-232.

4. UNISDR. 2008. Terminology: Basic Terms of Disaster Risk Reduction. Geneva: UNISDR (United Nations International Strategy for Disaster Reduction). <http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm>, Accessed 10 January 2014.
5. K. Hewitt, (ed), Interpretations of Calamity: From the Viewpoint of Human Ecology, Allen and Unwin, Boston, 1983.
6. J. Lewis, Development in Disaster-prone Places: Studies of Vulnerability, London: Intermediate Technology Publications,1999.
7. Ben Wisner, Piers Blaikie, Terry Cannon and Ian Davis.. At Risk: Natural Hazards, People's Vulnerability and Disasters, second edition. London: Routledge,2004.
8. I. Kelman, and J. West, Climate change and Small Island Developing States: a critical review, Ecological and Environmental Anthropology 5(1): (2009) 1-16.
9. CICERO and UNEP/GRID-Arendal, Many Strong Voices: Outline for an assessment project design. CICERO Report 2008:05. Oslo: CICERO (Center for International Climate and Environmental Research, Oslo),2008.
10. M. Matakī, K. Koshy and V. Nair Top-down, Bottom-up: Mainstreaming Adaptation in Pacific Island Townships, in N. Leary, J. Adejuwon, V. Barros, I. Burton, J. Kulkarni and R. Lasco (eds.) Climate Change and Adaptation, London: Earthscan, 2007, pp. 264-277.
11. H. Reid, M.Alam, , R. Berger, T. Cannon, S. Huq, and A. Milligan, (eds). (). Participatory learning and action: Community-based adaptation to climate change. London: International Institute for Environment and Development, 2009, p.13.
12. N.A. Marshall, P.A. Marshall, J. Tamelander, D. Obura, D. Malleret–King and J.E. Cinner, A Framework for Social Adaptation to Climate Change; Sustaining Tropical Coastal Communities and Industries, Gland: IUCN,2009.
13. A. Perez, H. Fernandez and C. Gatti (eds.), Building Resilience to Climate Change: Ecosystem-based Adaptation and Lessons from the Field, Gland: IUCN, 2010.
14. F.G Renaud, K. Sudmeier-Rieux, and M. Estrella, (eds), The Role of Ecosystems in Disaster Risk Reduction. United Nations University Press, Tokyo, 2013.
15. J.Mercer, I. Kelman., B. Alfthan, and T. Kurvits,. Ecosystem-based Adaptation to Climate Change in Caribbean Small Island Developing States: Integrating Local and External Knowledge. Sustainability 4(8): (2012) 1908-1932.
16. S. Mavrogenis, and I. Kelman.. “Lessons from Local initiatives on ecosystem – based climate change work in Tonga” in Fabrice Renaud, Marisol Estella, Karen Sudmeier (Eds.), The role of ecosystems in disaster risk reduction: From science to practice, Publisher: United Nations University Press, 2013 pp. 191-218.
17. J. Mercer, , I. Kelman, S. Suchet-Pearson and K. Lloyd, Integrating Indigenous and Scientific Knowledge Bases for Disaster Risk Reduction in Papua New Guinea, Geografiska Annaler: Series B, Human Geography 91(2): (2009) 157-183.
18. O. Warrick, Ethics and Methods in Research for Community – based Adaptation: Reflections from Rural Vanuatu, Participatory Learning and Action 60: (2009), 75.
19. I. Kelman, J. Mercer and J. West, Combining Different Knowledges: Community – based Climate Change Adaptation in Small Islands Developing States, *Participatory Learning and Action* 60: (2009), 41-53.
20. J. Mercer. Disaster risk Reduction or Climate change adaptation? Are we reinventing the wheel?, Journal of International development 22: (2010), 247-264.
21. UNEP, Risk and Vulnerability Assessment Methodology Development Project (RiVAMP), Linking Ecosystems to Risk and Vulnerability Reduction: The Case of Jamaica, Results of the Pilot Assessment, Geneva: UN Environment Program, 2010.
22. P. de Fontenay, and S.T.T. Utoikamanu Tonga: economic survey 2009. Pacific Economic Bulletin 24(3): (2009), 1-18.
23. T.K. Jayaraman, C.-K. Choong and R. Kumar Role Of Remittances In Tongan Economy, Migration Letters 7(2), (2010) 224-230.

24. J. Connell, and R.P.C. Brown, *Remittances in the Pacific: An Overview*. Manila: Asian Development Bank, 2005.
25. WTTC, *Travel & Tourism Economic Impact 2011: Tonga*. London: WTTC (World Travel & Tourism Council), 2011.
26. NAR. Barbados National Report of Progress made in addressing Vulnerabilities of SIDS through Implementation of the Mauritius Strategy for Further Implementation(MSI) of the Barbados Programme of Action, The Ministry of the Environment, Water Resources and Drainage Government of Barbados, 2010.
27. H. Machel, the Geology of Barbados – a Little Paradise in its own right, in Carrington S. (ed.) *Preserving Paradise*, the Barbados Museum and Historical Society, 2011, pp. 13-51.
28. Barbados National Communication, First Communication to UNFCCC, Barbados 2001
29. K. Watson, Our Environmental History, in Carrington S. (ed.) *Preserving Paradise*, the Barbados Museum and Historical Society, 2011, pp. 90-109.
30. R. Mahon. Achieving Sustainability in Barbados: Coping with Complexity and Uncertainty in Carrington S. (ed.) *Preserving Paradise*, the Barbados Museum and Historical Society, 2011, pp. 152-167.
31. P.D. NunnR., M.T. Hunter-Anderson, Carson, F. Thomas, S. Ulm and M.J. Rowland. Times of Plenty, Times of Less: Last-Millennium Societal Disruption in the Pacific Basin, *Human Ecology* 35: (2007), 385-401.
32. M. Pelling. *The Vulnerability of Cities: Natural disasters and social resilience*, EarthScan Publications, London, 2003.
33. Government of Seychelles, *Seychelles National Climate Change Strategy*, 2009.
34. G. Bertram, Sustainable development in Pacific micro-economies, *World Development* 14(7): (1986), 809– 822.
35. R.F. Watters, Mirab societies and bureaucratic elites, in A. Hooper, S. Britton, R. Crocombe, J. Huntsman and C. Macpherson (eds.), *Class and culture in the South Pacific* , Suva: Centre for Pacific Studies, University of Auckland and Institute of Pacific Studies, 1987, pp. 32–55..
36. G. Bertram, Introduction: The MIRAB model in the twenty-first century, *Asia Pacific Viewpoint*, Vol. 47, No. 1, (2006), 1-13.
37. R. Baron and A. Cara, Introduction: Creolization and Folklore—Cultural Creativity in Process, *Journal of American Folklore* 116(459): (2003) 4–8.
38. R. Cohen, Creolization and Cultural Globalization: The Soft Sounds of Fugitive Power', *Globalizations*, 4: 3, (2007) 369 — 384.