

Mainstreaming Climate Adaptation into Sectorial Policies in Seychelles

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Research Article

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Abstract

Mainstreaming climate adaptation objectives into existing policies and practices, as opposed to developing new or dedicated adaptation policies has several advantages for achieving sustainable change. Based on in-depth analysis of 31 strategic policy documents together with 34 stakeholder interviews, this article addresses the following questions across six sectors as follows: (i) to what extent has climate adaptation been mainstreamed into sectoral policies; (ii) what are the constraints impeding adaptation mainstreaming; (iii) what steps are needed to address inherent constraints/obstacles in order to facilitate adaptation mainstreaming across sectoral policies in Seychelles. While significant progress has been made in mainstreaming climate adaptation into the agriculture, water and energy sectors, little progress seems to have occurred in the Blue Economy, forestry, and health sectors. The lack of progress in these sectors can be attributed to the absence of national policies and or lack of add-ons on adaptation projects in these sectors. For example, mainstreaming climate adaptation into sector policies and strategies have occurred on an ad hoc basis through different projects. Stakeholder further indicated that there are still many obstacles such as the lack of human and financial resources that need to be addressed to enhance climate adaptation mainstreaming especially in the health, agriculture and BE sectors. Further, sectoral objectives were given greater priorities when compared to adaptation objectives especially for sectors whose mandate were not directly linked to climate change. In fact, the issue of coordination and corporation not just among government entities, but also between the government and private sectors was highlighted another barrier. Strategies for improvement include long-term climate impact studies, better public-private partnership, building on existing adaptation projects, ensure consistency in policy, and enhance access to resources – human, technical and financial. Lastly, adaptation mainstreaming is a process that should institutionalized across sector to promote sustainable growth.

1 Introduction

Small Island Developing States (SIDS) are generally considered highly vulnerable to climate change because they suffer from similar inherent environmental challenges that are linked to their smallness, remoteness and exposure to natural hazards [1]. While uncertainties does exist regarding the timing, magnitude and the distribution of climate-related impacts on ecosystems, local livelihoods and societies, there is high confidence that the global climate is changing [2]. Moreover, climate variability and change in the absence of effective adaptation and mitigation measures can constrain nation states from achieving the Sustainable Development Goals especially for SIDS [3] and developing countries due to limits to their abilities to adapt also known as the adaptation deficit [4]. Some of these limits are connected to available resources (financial, human, and technological), political and organizational factors. The mainstreaming of climate change into national development programs and policies is at the core of the Nationally Determined Contributions and has also been promoted in the nexus approach for Water-Energy-Food in order to increase the adaptive capacity of developing countries most of which depend of climate-sensitive economic activities [5].

Even with the much publicized net zero emissions [6], improving the adaptive capacity of developing countries and SIDS in particular is not an option but imperative if sustainable growth are to be achieved. This is because the lifespan and impacts of greenhouse gases live beyond the emission phase. For example, life cycle analysis based on carbon isotope has proven that fossil fuel carbon dioxide requires close to 100 years to be fully disintegrated in the atmosphere [7]. Consequently, adaptation to climate change is considered necessary by development agencies and is largely promoted by the UN Sustainable Development Goals (SDGs) and the 2015 Paris Agreement/Nationally Determined Contributions. For SIDS in particular, adaptation to global climate change is a priority and it's been described as an urgent requirement among these group of countries [8]. In another study by Robinson [3], the importance of adaptation to climate change as a pathway for SIDS to achieve sustainable development is clearly emphasized. However, two options are available to policy-makers and development practitioners: i) integrating also known as mainstreaming climate adaptation objectives into existing sectoral policies and practices, or ii) the development of stand-alone adaptation policies and programmes [9, 10].

Irrespective of the approach that is adopted, the role of agencies/institutions, how they influence the decision-making process and the resources at their disposal are at the core of the adaptation process. Therefore, institutions play a key role in climate adaptation because understanding the institutional dimensions in terms of their role in providing an enabling environment (ensuring policies translate to actions and effective collaboration), access to resources (financial, human and technological), awareness on climate change and timing is crucial to mainstreaming adaptation into sectoral policies [11, 12]. However, adaptation-related policies seems to be coherent and the challenge remain to translate these policies into implemented action – thereby creating an “implementation gaps” vacuum which is more conspicuous in developing countries [13, 14]. Given that “*the road to adaptation is always under construction*” [15], knowledge on what makes mainstreaming effective is scare and fragmented. The case of the Seychelles represent a broader policy challenge relevant for a similar set of countries (e.g. vulnerable island states).

Whilst considerable progress has been made towards mainstreaming climate adaptation into sectoral policies in the Caribbean and Pacific SIDS [3], Southern, Central, East and West Africa [5, 12, 14, 16], little is known about the Indian Ocean SIDS especially the Seychelles. Also, adaptation is relatively new to some sectors and are yet to be fully understood and mainstreamed into policies and programs. Although adaptation mainstreaming is undoubtedly the most cost effective approach of adapting and building resilience to climate change, unified frameworks are lacking [13]. However, Wamsler and Pauleit [17] identified six mainstreaming strategies through which they can occur (see section two). Building on this framework, this paper addresses the following key questions: (i) to what extent has climate adaptation been mainstreamed into sectoral policies; (ii) what are the constraints impeding adaptation mainstreaming; (iii) what steps are needed to address inherent constraints/obstacles in order to facilitate adaptation mainstreaming across sectoral policies. These questions are addressed with Seychelles as case study, while highlighting much broader lessons for other developing countries especially SIDS. Furthermore, some of the findings can be used to ensure proper alignment of sectoral policies and action

plans into Seychelles Sustainable Development Strategy [18] and the Updated Nationally Determined Contributions [19].

2 Mainstreaming Climate Adaptation – Conceptual Perspective And Framing

Integration or the articulation of information into policies (national and sector) and measures in order to improve the adaptive capacity of sectors and or ecosystems to the impacts of climate change is known as mainstreaming [20]. Considering that it is easier to start with existing policies and practices rather than creating new or specific adaptation policies, is one of the strength why mainstreaming is promoted globally. Through this concept, climate risks can be easily incorporated into policy and practice to support short and long-term development planning. However, the effectiveness of climate adaptation mainstreaming would require some insights into mainstreaming drivers and barriers. Previous studies in the Seychelles [21], other SIDS [3], and from empirical research globally [13], have identified the following drivers and barriers to adaptation mainstreaming which includes: (i) political factors, (ii) timing, (iii) characteristics of the adaptation problem, (iv) cognitive factors, (v) resources, and (vi) organizational factors (see figure 1). These factors are a double edged sword, and based on available resources (financial, technical, and human), governance structures and policies, they can either drive or hamper the adaptation mainstreaming process.

Mainstreaming is not a new concept and aside from climate change, its usage can be traced to other global development issues such as gender inequality, poverty alleviation, millennium development goals, and the ongoing sustainable development goals [12, 22, 23]. The Paris Accord through its much publicized NDCs has sustained the momentum on climate change and it driving several initiatives locally. Also, adaption projects often provide opportunities for add-ons and co-benefits that are also relevant for mitigation as demonstrated by the Ecosystem-based Adaptation to climate change project in the Seychelles [15]. Therefore, the issue of timing is crucial with the right timing acting as a driver and vice versa. The Updated NDC of Seychelles [19] applies a sector approach with clearly defined timelines and adaptation actions to be implemented. However, the actualization of these targets are largely dependent on external donor funding. Just two institutions are available national that provide financial support for climate change projects – Environment Trust Fund (ETF) and the Seychelles Conservation and Climate Adaptation Trust (SeyCCAT) both of which cannot satisfy the domestic demand of proposed projects [21]. Key challenges identified by Etongo [21] that acts as barriers to climate change adaptation in Seychelles include human resources capacity (high staff turnover and shortage of trained personnel on adaptation), ineffective coordination and corporation between government department, and also with the private sector, lack of financial and technological resources.

A systematic review on “what works” in regards to mainstreaming climate adaptation measures arrived at a conclusion that explicit definitions and unified frameworks are required to allow for well-informed policy recommendation [13]. This case of SIDS becomes even more relevant in this regards as Chapter 29 (Small Islands) of the Fifth Assessment Report of the IPCC suggest that more needs to be learnt on

practical approaches to achieve climate adaptation mainstreaming in the context of SIDS [24]. At starting point to improve such understanding could begin with the mainstreaming strategies identified by Wamsler and Pauleit [17], and presented as figure 2. This conceptual perspective can better inform decision-makers the level at which adaptation mainstreaming is occurring. Therefore, inspired by this conceptual perspective on climate adaptation mainstreaming (Figure 2), the current study assesses the extent, challenges encountered and strategies to improve climate adaptation mainstreaming in following six sectors as outline in Seychelles Updated NDC: (i) forestry, (ii) energy, (iii) agriculture, (iv) water, (v) health, and (vi) blue economy, specifically coastal management, tourism and fisheries.

3 Methods

A mixed method approach was adopted in the current study including (i) an in-depth qualitative method involving the analysis of 31 policy documents (Table 1), and (ii) semi-structured interviews with 34 key stakeholders in relevant government ministries/institutions and other organizations (for more detail, see Table 2). A qualitative design offers an important value which according to Gephart [25] provide “description and understanding of the actual human interactions, meanings, and processes that constitute real-life organizational settings”. The method section is organized as follows: review of relevant documents; selecting interviewees and interviewing; and analyzing interviewee responses.

3.1 Review of relevant documents

The document analysis (see Table 1) followed a systematic approach with a focus on how climate adaptation has been mainstreamed into sectoral policies since 22 August 1992 after the country ratified the United Nations Framework Convention on Climate Change (UNFCCC). Systematic procedure consists of searching and synthesizing research evidence on the state of knowledge on a given topic or based on research questions [26, 27]. Keywords used during the search include: ‘climate/climatic change adaptation’, ‘drought’, ‘flood’, ‘mitigation’ ‘environmental protection’, ‘environmental education’, and ‘climate change communication’. The search generated 31 policy documents including strategies and action plans (Table 1). Mainstreaming is considered to occur when (i) climate change adaptation/mitigation is mentioned in the policy document(s); and (ii) specific actions are included to account for and enable the mainstreaming of climate adaptation. In this study, sectoral policy refers to any initiatives or projects put in place by government aimed at mainstreaming climate adaptation in the sectors already mentioned.

Table 1
List of documents reviewed

Document title	Sector	Source and year
Update of the Nationally Determined Contribution of the Republic of Seychelles.	Cross-cutting	GoS [19]
Seychelles National Climate Change Policy.	Cross-cutting	GoS [28]
Seychelles Protected Areas Policy	Biodiversity	GoS [29]
Seychelles' National Biodiversity and Action Plan 2015 – 2020.	Biodiversity	GoS [30]
Seychelles National Climate Change and Health Adaptation Plan of Action 2014 – 2018.	Health	MoH & MEECC [31]
Seychelles National Food and Nutrition Security Policy.	Agriculture	GoS [32]
Seychelles National Agriculture Investment Plan.	Agriculture	GoS [33]
Seychelles National Agroforestry Policy	Agriculture	SNAP [34]
Seychelles Wetlands Policy and Action Plan 2019 – 2022.	Cross-cutting	GoS [35]
Seychelles Fishing Authority Strategic Plan 2018 - 2020	Fisheries	SFA [36]
Seychelles Water Supply Development Plan 2008 – 2030.	Water	Mussard [37]
Seychelles Port Authority Strategic Plan 2019 – 2023.	Cross-cutting	SPA [38]
Environment Management Plan of Seychelles 1990 - 2000	Cross-cutting	GoS [39]
Environment Management Plan of Seychelles 2000 - 2010	Cross-cutting	GoS [40]
Sustainable Development Goals (SDGs) Baseline Assessment Report	Cross-cutting	GoS [18]
Technological Needs Assessment Report - Adaptation	Institutional	GoS [41]
Proposal for Energy Policy of the Republic of Seychelles 2010-2030	Energy	GoS [42]
Seychelles Marine Spatial Planning Legislative and Policy Review	Blue economy	GoS [43]
Seychelles Coastal Management Plan 2019 - 2024	Coastal management	World Bank & MEECC [44]
Seychelles Blue Economy Strategic Policy and Roadmap: Charting the Future 2018 - 2030	Blue economy	GoS [45]
Support for Articulating the Blue Economy and Coastal Adaptation Investment Priorities for Seychelles' Climate Resilience	Blue economy	Vergouwen et al. [46]
Seychelles National Climate Change Strategy	Cross-cutting	GoS [47]

Document title	Sector	Source and year
Seychelles National Forest Policy and Legislation.	Biodiversity	GoS [48]
Evaluating the Impacts of Sea Level Rise and Storm Surges on Seychelles' Critical Infrastructure.	Critical infrastructure	Maillard et al. [49]
Seychelles National Integrated Emergency Risk Management Plan.	Disaster management	World Bank & DRDM [50]
Disaster Risk Management Act.	Disaster management	GoS [51]
Victoria Risk Assessment Task Force.	Disaster management	DRDM [52]
Land Fill Fire of September 2020.	Disaster management	DRDM [53]
Seychelles' Initial National Communication under the UNFCCC	Cross-cutting	GoS [54]
Seychelles' Second National Communication under the UNFCCC	Cross-cutting	GoS [55]
Seychelles' Nationally Determined Contribution under the UNFCCC	Cross-cutting	GoS [56]

3.2 Selecting interviewees and interviewing

An inventory of institutions responsible for mainstreaming climate adaptation/mitigation into sectoral policies either directly or indirectly was carried out using two criteria; (a) function; and (b) knowledge and abilities. Potential interviewees had to meet the following four criteria; (i) had oversight of climate change, environment and/or development portfolio in a government agency, sector or department, (ii) have been part of the climate change discourse in the Seychelles for at least five years, (iii) well-versed in adaptation in the Seychelles' context, and (iv) confirmed their availability and consent to participate in the interview. Additionally, a snowball sampling technique was also employed to identify other interviewees and this technique involves the use of participants to recommend and contact other participants [57, 58] who fulfill criteria 1 to 3. This resulted in 34 stakeholders that were interviewed (see Table 2). A semi-structured interview technique was applied with the relevant stakeholders and this approach was chosen because an important benefit is that participants are more likely to openly express their views [59]. Interviews were conducted face-to-face and all the stakeholders gave verbal consent after having received a brief explanation on what the research is about and the type of information that will be needed from the participants. In order to maintain anonymity, each interviewee was assigned a code. Interviews lasted 30 – 60 minutes and were conducted in both English and Creole. These interviews took place from July 21st to October 27th 2021 and were audio recorded and in most instances notes were taken.

Table 2
Summary of stakeholders interviewed by institution and organization

Structure	No of Participants	Type of Organization
Ministry of Fisheries and Blue Economy	3	Government
Department of Environment (MACCE)	4	Government
Department of Agriculture (MACCE)	2	Government
Department of Energy and Climate Change (MACCE)	4	Government
Land Transport Department (MHILT)	1	Government
Tourism Department (MFAT)	2	Government
University	10	Academia
Citizen Engagement Platform Seychelles (CEPS)	2	Civil Society
Seychelles Conservation and Climate Adaptation Trust (SeyCCAT)	2	NGO
United Nations Development Programme (UNDP)	2	IO
<p><i>NGO: Non-Governmental Organization</i> <i>IO: International Organization</i> <i>MACCE: Ministry of Agriculture, Climate Change and Environment</i> <i>MHILT: Ministry of Habitat, Infrastructure and Land Transport</i> <i>MFAT: Ministry of Foreign Affairs and Tourism</i></p>		

3.3 Analyzing interviewee responses

The five-step process outlined by McCracken [60] was applied in the analysis of the responses gotten from the interviewees. In the first step, voice-recorded interviews were listen closely twice; while interview notes in cases without voice recording were also read twice. In the second step, initial interpretive and descriptive categories were identified. For the third step, categories that were identified in step two and constituting initial codes were used to identify further patterns in the data. Broad themes were identified from clustering a single interviewee’s responses as the fourth step. In the fifth and last step, these broad themes were examined across all interviews and predominant themes are presented in the result section of this paper.

4 Results And Discussion

4.1 To what extent has climate change adaptation been mainstreamed into sectoral policies?

Since the Rio Earth Summit in 1992, climate change adaptation became a topical issue in the Seychelles and the process has been guided by different policies and plans that integrate climate risks within the social and economic development sectors [19]. Seychelles' response to climate change and environmental protection is also reflected in the country's national climate change policy [28] and adaptation is given greater priority due to the vulnerability of the island state to the impacts of climate change [18, 56, 61]. The long history of climate adaptation into policies and strategies could be traced to Seychelles' Initial and Second National Communication to the UNFCCC [40, 55].

Guided by a sector approach, the recently updated NDC gives priority to the following strategic actions such as: nature-based solutions to protect coastal ecosystems; adapting an integrated Ridge-to-Reef (R2R) approach to coastal management; developing a Port Master Plan; improving the management of freshwater resources; among others [19]. In fact, Chapter 4 of the Second National Communication to the UNFCCC focuses entirely on vulnerability and adaptation measures which clearly outlines existing adaptation measures and also options to enhance its mainstreaming into policies and national development plans [23]. The reviewed policy documents together with the stakeholder interviews were used to answer the question "to what extent has climate adaptation been mainstreamed into sectorial policies?" Details of these findings are presented for each sector.

4.1.1 Forestry Sector

National policy in the forestry sector has its roots from environmental policy as expressed in the Environmental Management Plans of the Seychelles (EMPS 1990 – 2000), as well as from other international conventions. Examples of such conventions include the Convention on Biological Diversity (CBD); the United Nations Framework Convention on Climate Change (UNFCCC); Chapter 11 of the Agenda 21 of the United Nations Conference on Environment and Development (UNCED) on Deforestation; the Forest Principles of UNCED [39]. Moreover, the Seychelles' Protected Areas Policy is another important policy document that reinforces Seychelles' position of legally protecting 47% of the total land area [29]. Also, this policy document make reference to the Forestry Reserves Act of 1955 that sets out provisions for the designation of "forest reserves". A further development was the Seychelles National Biodiversity Strategy and Action Plan 2015 – 2020 (NBSAP) which addresses some issues that are relevant to adaptation such as financing, capacity building and climate related biodiversity issues [30].

4.1.2 Agricultural Sector

The Seychelles Sustainable Development Strategy (SSDS) is an important document that addresses adaptation mainstreaming across sectors inclusive of agriculture. One of the five core areas of focus as outlined in the SSDS is food security, trade and diversification [61]. A significant milestone in this sector is

the Seychelles National Food and Nutrition Security Policy (SNFNSP) that provided an enabling environment for mainstreaming climate adaptation in the agricultural sector [32]. That notwithstanding, climate change adaptation was initially mainstreamed in agricultural policies in the early 90s at the onset of the activities to put together the Initial National Communication (INC) to the UNFCCC (initiated in 1993) with the launch of the Seychelles National Climate Change Committee. Concerns for climate change mainstreaming was further reinforced with the launch of the Second National Communication (SNC) in 2006 and by then the Cabinet of Ministers were prioritizing climate change and the need for national socio-economic sectors to adapt through proper policies and strategic approaches [55].

Given that “the road toward adaptation is always under construction” [15], the Seychelles National Agricultural Investment Plan (SNAIP) 2015 – 2020 was put in place to improve food security while mitigating the impacts of climate change. The focus of one of its programme is to protect and sustainable use agricultural lands and water. A study by FAO and ICRISAT [62] on Climate-Smart Agriculture in Seychelles highlighted the mainstreaming of adaptation in the agriculture sector. Some actions includes the use of drought resistant crops such as root crops (cassava, sweet potato) and maize on the one hand, and rainwater harvesting, streams, rivers and boreholes to irrigate farmlands – an ongoing practice for over three decades.

4.1.3 Health Sector

Climate change will affect the occurrence of diseases in Seychelles, and a few recent crises (e.g. dengue fever) signaled the need to adapt proactively [63]. Although climate adaptation responses in the health sector is relatively new, some progress has been made. Health considerations were captured in the Environmental Management Plans [39, 40] and in the Seychelles Sustainable Development Strategy – SSDS [61] despite very little implementation. A major step towards mainstreaming climate adaptation in this sector is the development of the Health National Action Plan (HNAP) for Seychelles [31]. This action plan addresses health adaptation process at national level that has the potential to reduce climate related impacts on health [31].

Collaboration with key ministry responsible for climate change is another strategy that has enhance climate adaptation mainstreaming in the health sector. For example, The MEECC currently known as the Ministry of Agriculture, Climate Change and Environment (MACCE) together with the Ministry of Health (MoH) collaborate on ad-hoc basis on events such as the management of disease outbreak, environmental pollution and other specific programs to address health and environmental matters. Mainstreaming climate adaptation in this sectors has occurred partly by improving conditions for healthy leaving. For example, the new Building Codes by Seychelles Planning Authority (SPA) for residential and commercial buildings has the potential to improve resilience especially through specifications to adopt solar PV, rainwater harvesting systems, double glaze windows and to promote the greening of common space [15].

4.1.4 Energy Sector

Creating an enabling environment through policy instruments that facilitate the transitioning from fossil fuel to renewable energy have been incorporated into different strategies in the Seychelles. In this regard, guiding principles for the energy and transport sector are fully integrated into national development strategies [61]. For example, the share of energy from renewable sources was estimated at 5% for the year 2020 and is expected to increase to 15% in the year 2030 [42]. Several projects on biomass to energy, solar hot water, solar PV and wind energy have been implemented across the Seychelles in order to achieve the proposed share of energy from renewable sources. Moreover, the importation of renewable energy technologies have been exempted from the payment of value added tax (VAT) dating back to the year 2010 [42]. Such a financial policy incentive is attractive for both households and businesses to adopt especially rooftop PV so as to reduce emissions from the use of fossil fuel and thereby mitigating the impacts of climate change [64].

Information gathered from the Seychelles Energy Commission (SEC) indicated that 165 businesses and 406 households have adopted rooftop PV in Seychelles between 2013 until the end of February 2021 [15]. Aside from the VAT exemption, the Government of Seychelles has put in place other incentives to facilitate the adoption of rooftop PV. These incentives include the following: (i) net metering scheme, (ii) rebate scheme for rooftop PV systems, (iii) energy efficiency program (iv) the Small and Medium Enterprise (SME) loan scheme [65]. These incentives are expected to drive a transition from fossil fuel usage to renewable energy especially rooftop solar PV. Energy efficiency is largely promoted through the Seychelles Resource Efficiency Project. As far back as April 2017, the sole energy provider in the Seychelles having been giving out two LED bulbs in exchange of two incandescent light bulbs to inhabitants of the three main islands of Seychelles [66].

4.1.5 Water Sector

Water provides multiple benefits such as the generation of hydroelectricity, ensures food production, needed for domestic and industrial purposes, supports economic development which highlights its linkages with other sectors. The law governing the water sector in the Seychelles are contained in different pieces of legislation [67]. More importantly, the Seychelles National Water Policy is influenced by and strives to contribute in achieving sustainable growth with an emphasis on SDG 6 on access to clean water and sanitation and goal number 13, 14, and 15 that deals with issues related climate change, the blue economy and the terrestrial environment. Integrated water management has also been promoted by the Government of Seychelles for over a decade now. This management strategy have focused on energy efficiency, demand management, and developing alternative supply sources from rainwater harvesting and water use.

Adopted in July 2017, the National Water Policy and National Integrated Water Resource Management Plan reinforced the momentum on water management [68]. Access to water resources as an adaptation strategy has been promoted for both domestic and agricultural uses. For example, rainwater harvesting systems have been incorporated in educational establishments and in smallholder farming systems with support from international NGOs, local NGOs and the MACCE and Ministry of Education. In some cases, wetlands have been restored to provide farmers with access to water as part of the Ecosystem Based

Adaptation to Climate Change in Seychelles Project. Therefore, adaptation has been mainstreamed effectively in the water sector despite some areas that might need further improvement.

4.1.6 Blue Economy Sector

In order to avoid duplication, the Blue Economy (BE) within the context of this study focuses on coastal management, fisheries and aquaculture, tourism and critical infrastructure sectors. An important development in this sector is the Blue Economy Strategic Policy Framework and Roadmap 2018 – 2030 [45]. This framework and roadmap provide an approach to ocean-based sustainable development which brings the economy, the environment and society together toward achieving global agendas such as the Sustainable Development Goals 2030, Target 11 of the Convention on Biological Diversity and the Paris Agreement. Mainstreaming climate change adaptation into the different sub-sectors of the BE also features prominently in the Seychelles Updated Nationally Determined Contribution to the UNFCCC [19].

The Seychelles Strategic and Land Use Plan which provides guidance on land use management from 2015 – 2040 also take into account adaptation mainstreaming within the BE sector [43]. This has led to climate proofing development that are fully integrated in the New Building Codes in the Seychelles. Also, Seychelles management of coastal wetlands falls under the Environment Protection Act and the Seychelles Wetland Policy and Action Plan [35]. A special focus has been given to coastal wetlands for mitigation and adaptation co-benefits in line with the development of the blue carbon concept [69] which has gained traction in Seychelles and largely promoted by the Seychelles' Conservation and Climate Adaptation Trust (SeyCCAT). Coral restoration also has a long history in the island state with the Nature Seychelles Reef Rescuers program that has grown 45,000 corals in underwater nurseries and this represents the world's largest coral reef restoration program [45].

Regarding the fishery sector, the overall policy framework is captured in the “Seychelles Fisheries Sector Policy and Strategy 2019” [38]. This document aim towards a long-term sustainable fisheries and aquaculture management and conservation, to ensure its key role in the sustainable development of the country. The fisheries sector is regulated by six key pieces of legislations [38]. In 2018, Seychelles National Aquaculture Policy 2018 – 2022 was published. The objective of the policy is “*guiding an effectively managed and environmentally responsible aquaculture industry that contributes towards food security and the creation of wealth in Seychelles*” [36].

Pertaining to tourism, the Tourism Master Plan describes the objective to develop a tourism plan specific for Mahe, Praslin, La Digue and the Outer Islands given that the impact of climate change are not equally distributed across the Seychelles group of islands [45]. An important milestone in this sector is the Sustainability Label that was introduced in 2011. The purpose of this initiative is to promote the integration of sustainability measures into the operations of hotels of all sizes in Seychelles. Some of the focal areas include reducing the amount of paper used, adopt energy and water efficiency and conservation measures, reduce the amount of waste generated and to promote conservation activities and community engagement. For example, plastic bottles have been replaced with reusable bottles in order to reduce the amount of waste generated. However, majority of the hotels that conform to these

practices are the luxury hotel. Regarding climate change adaptation, initiatives such as rainwater harvesting, gardening, renewable energy and energy efficiency, waste management is promoted in the tourism industry.

4.2 What are the constraints impeding adaptation mainstreaming?

The effective integration of climate adaptation into sector policy is a process and not an outcome, Therefore, despite some progress that has been achieved by the Government of Seychelles, some constraints have been identified. These constraints that are based on the stakeholders that were interviewed are grouped into the following categories as follows: (i) policy and governance constraints, (ii) insufficient financial resources, (iii) risk of diminishing visibility and attention, (iv) lack of clarity on mainstreaming strategies implemented, and (v) human resource capacity.

4.2.1 Policy and governance constraints

Climate change issues are interlinked across different sectors and there is a need for policy harmonization to ensure alignment on the one hand and on the other hand cross-sectoral collaboration. Chief among the constraints mentioned was the 2009 climate strategy of Seychelles that is due for revision given that the current version does not align with the climate change policy [28] and the Updated Nationally Determined Contributions [19]. Sector policies in Seychelles are given greater priorities especially for those sectors whose mandates are not directly linked to climate change such as health, blue economy, fisheries, etc. The case of Seychelles represent a broader policy challenge relevant for a similar set of countries – vulnerable island states [3], and developing countries [13]. In most cases, revision of important climate-related policies and strategies are dependent on donor funding externally which might not be available on time.

Climate adaptation often require coordination and collaboration among different actors who have different objectives, with unequal power in decision making and resources at their disposal [13, 17]. For example, private sector engagement in climate change issues in the Seychelles have been very weak [21]. Although the climate change policy [28] makes provision for a National Climate Change Council (NCCC) with representatives from the private sector, this council is yet to be established. Two of the 14 functions of the council include (i) to ensure that integration of climate change into sectoral policies and strategies; and (ii) to ensure that national development policies and strategies are consistent with sectoral plans and strategies. Policy and governance constraints also suffers from the reactive rather than the proactive approach to climate adaptation in addition to greater focus to address short than long-term climate-related risks – a view support by an earlier study in the Pacific and Caribbean SIDS [3]. Therefore, a holistic approach is imperative which addresses immediate or short-term climate risks while concomitantly putting in place strategies and action plans to carter for medium and long-term adaptation measures.

4.2.2 Insufficient financial resources

Insufficient financial resources featured prominently from all the stakeholders that were interviewed. Despite highlighting some financial support received from international organizations such as the Adaptation Fund (AF), Global Environment Facility (GEF), Japan International Cooperation Agency (JICA), the lack of financial resources for continuity was raised as a major barrier. Funds were provided through the 'Global Funds for Adaptation' and the European Union for pilot projects that were implemented at specific sites for instance, the drainage and erosion project on La Digue [70].

Coastal erosion and flash floods still persist and the budget allocation does not cover all of the hot spot sites across the Seychelles. Inadequate technologies and infrastructures was a key concern raised by stakeholders that is linked to insufficient financial resources. However, the Environment Trust Fund (ETF) and the Seychelles Conservation and Climate Adaptation Trust (SeyCCAT) were identified as national institutions that finance climate adaptation project, but at a much smaller scale. One of the stakeholder did mentioned that the "US\$100 billion a year to less wealthy nations by 2020, to adapt to climate change and mitigate have not been met". A recent study also showed the \$100-billion target was out of reach [71]. Therefore, financial resources continues to remain a key constraints to climate adaptation into sectorial policies in Seychelles and elsewhere given that some of the strategies are hardly translated into projects or actions on the ground.

4.2.3 Risks of diminishing issue visibility and attention

A dedicated approach that relies on highly specialised institutional responsibilities, dedicated funds and a clear legal framework that can provide an enabling environment for stand-alone adaptation policies and programmes is lacking. Climate adaptation mainstreaming requires targeted strategies and action that are beyond mere aspirations in order to be effective. While all the 31 policy documents that were reviewed were explicit on the integration of adaptation actions across sectors, there wasn't any accepted agreement about what mainstreaming is to achieve, i.e. when it is effective, and how this could be measured – a key barrier that has been raised by other studies [13, 72, 73, 74].

As such, the relative weight and priority adaptation objectives in comparison to sectoral objectives is highly skewed and might compromise climate compatible development as indicated by England et al. [16]. It came out clearly during the interviews that climate change issues are considered the responsibility of the MACCE especially as the sector strategies of the MACCE deals mostly with issues around climate change when compared to other sectors and the ministry also doubles as the UNFCCC focal point. The implication therefore is that sectorial objectives are given more attention while climate-related issues might receive little attention.

4.2.4 Lack of clarity on mainstreaming strategies implemented

A key question raised by majority of the stakeholders was that at what level is mainstreaming occurring in sectorial policies? Although significant progress has been recorded regarding the integration of climate adaptation into sectors as highlighted in the Second National Communications submitted under the

UNFCCC and also in the Updated Nationally Determined Contributions [19, 55] compared to previous versions [39, 40, 54, 56], considerable challenges on mainstreaming strategies still persist. However, what is being mainstreamed and how its effectiveness could be measured is a problem that is not limited to the Seychelles [21] but common in other SIDS [3] and more importantly, has been identified as a challenge globally [13]. Therefore, the lack of unified frameworks for adaptation mainstreaming have affected well-informed policy recommendations.

Although stakeholders were not specific regarding mainstreaming strategies for climate adaptation in the Seychelles, the theoretical framework Wamsler and Pauleit [17] shows that the five mainstreaming strategies have been implemented in the Seychelles. These strategies include add-ons through new projects building on previous projects. A good example in the Seychelles' case is the Ridge-to-Reef projects that began in 2020 and is building on the Ecosystem Based Adaptation to Climate Change project, which will come to an end in March 2022. Regarding the institutionalization of adaptation components into sector policies and strategies, the stakeholders were of the opinion that the Ministry of Agriculture, Climate Change and Environment (MACCE) has made significant progress compared to other government ministries. Other strategies that require greater attention in order to improve the adaptation mainstreaming landscape across sectors in the Seychelles include effective collaboration within government entities, and between the government and private sector; a framework for adaptation mainstreaming; and higher level support for funding, ongoing and potential projects on adaptation. The key concern that arises then is to what extent or how effective are the different mainstreaming strategies to climate change adaptation in the Seychelles?

4.2.5 Human resource capacity

Mainstreaming climate adaptation into sectorial policies would require knowledge on adaptation and what action plans or strategies can be implemented across sectors for building adaptive capacity to climate change impacts. This constraints partly links to having staffs across different sectors with trans-disciplinary background on climate adaptation and how it can be integrated into sectorial policies. For example, stakeholders in the health sectors could easily identify actions that have been mainstreamed into their sector such as energy efficient technologies and renewable energies to reduce carbon dioxide emissions. But when interviewed on adaptation mainstreaming, the stakeholders had very little idea on how this could be done – an indication of human resource capacity to address this need. The small population size of Seychelles also raises issues of human resources capacity which has been identified by another study on mainstreaming climate adaptation in the Pacific and Caribbean SIDS [3]. It was also mentioned that staffs that are already employed do not in some cases get a release to further their education at the University of Seychelles or abroad. Therefore, new knowledge and skills needed to enhance effective climate adaptation mainstreaming into sector policies, strategies and action plans are lacking in specific disciplines or in short supply.

4.3 Recommendations from stakeholders

A number of measures were proposed by the stakeholders that has the potential to improve the mainstreaming of climate change into sectoral policies. These recommendations are cross-cutting for the six sectors considered in this study and are therefore not presented for each sector separated. However, reference is made to specific sectors when needed for emphasis or when addressing issues of specific nature.

Informed policies are based on sound science which require human resource capacity and available financial resources. Pertaining to research that can inform policies, the Blue Economy Research Institute (BERI) and the Environmental Science Department at the University of Seychelles was identified as a potential stakeholder that can be supported financially by the Government of Seychelles to engage in climate-related research – a view supported by a recent study in Seychelles [46]. Stakeholders argued that the university already has the human resource capacity to produce research that is of high quality that can support the climate adaptation process. They went further to mention that collaborative research with government institutions for example the MACCE and other NGOs is important for capacity building in order to increase the pool of researchers in the future. Another focal area mentioned was capacity needs at the local level to address climate adaptation in Seychelles which was mentioned as a priority area of research that needed urgent attention. One of the stakeholder mentioned that the District Authorities (DAs) are the gatekeepers to the communities and should be equipped with the technical skills needed to address climate change issues especially adaptation which is location-specific.

While the Ministry of Agriculture, Climate Change and Environment (MACCE) is responsible for the coordination of climate change issues nationally, the collaboration among government entities was of great concern. One of the stakeholder recommended that the ongoing restructure in the MACCE on how to coordinate climate change activities should take into account the needs and aspirations of other ministries. Furthermore to that, it was recommended that the Seychelles National Climate Change Committee with representation from all the sectors should be used more effectively for adaptation mainstreaming and policy harmonization. Many stakeholders also echoed that the climate strategy that is currently revised should clearly outline how adaptation should be mainstreamed into sectors by providing some guidelines.

Awareness raising also came out as another recommendation. In this regard, it was recommended that the government through the Ministry of Education should continue its support with the Eco Schools in all the secondary schools in the Seychelles. Also, that weather stations should be installed in all schools in the country and it will arouse curiosity among pupils and students thereby encouraging them to develop interest in climate science which could reduce the deficit in climate scientists in the long term.

To provide greater access to climate information, putting in place a reward package such as a monthly/annual prizes to compensate local media organizations and journalists that run regular programmes or report issues on climate change and environmental protection was highly recommended. It was also recommended that the National Assembly, District Administrators Offices and faith-based

organizations are important platforms that could be used to easily disseminate climate information to community members.

Regarding finance for adaptation projects, it was recommended that sectors or ministries work closely with NGOs and research institutions to secure funding either locally or internationally. The collaboration between the MACCE and the University of Seychelles in securing funding from the Common Market for Eastern and Southern Africa (COMESA) on an adaptation project, was cited as an example. This form of collaboration according to some of the stakeholders can benefit access to funding for adaptation project from two domestic funders on climate change projects – Environment Trust Fund (ETF) and the Seychelles Conservation and Climate Adaptation Trust (SeyCCAT). Lastly, the institutionalization of climate adaptation into sector policy was also of greater concern as indicated by the stakeholder. They see adaptation as a process and its institutionalization will mean that it becomes part and parcel of sector objectives and will receive the much needed attention that it deserves.

5 Conclusion

Mainstreaming climate adaptation into sectoral policies has the potential to support compatible development in order to achieve sustainable growth. While mainstreaming climate adaptation features prominently in most important climate change policies and action plans, its implementation is still a work in progress. For example, mainstreaming climate adaptation into sector policies and strategies have occurred on an ad hoc basis through different projects. Moreover, some of the strategic documents that provided guidance for adaptation mainstreaming were obsolete and didn't align with important climate policy documents. The case of the Seychelles represents a broader policy challenge relevant for SIDS and developing countries that are highly dependent on external donor funding to produce or update important policy documents related to climate change.

This study showed that some of the barriers to climate adaptation mainstreaming include the lack of human and financial resources. Seychelles became a high income country in 2015 which has limited access to certain categories of funding that are mostly allocated to low and middle-income countries. Human resource capacity building should be promoted among government staffs on climate-related issues to ensure that knowledge on adaptation for sector-specific mainstreaming is achieved. Other constraints to adaptation mainstreaming into sector policies include the issue of coordination and collaboration and mainstreaming occurring mostly on an ad hoc basis through projects with little opportunities for add-ons. As such, adaptation mainstreaming should be approached as a process that must be institutionalized across the various sectors for it to become effective. Finally, the case of the Seychelles raise some issues in relation to the mainstreaming/climate policy integration literature and therefore can inform theoretical development especially in the area of developing unified frameworks that can allow for well-informed policy recommendation.

Declarations

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Authors' contribution

DE designed the study, coordinated the data collection, conducted the document analysis on the 31 policy document, wrote and revised the final manuscript.

Data availability

The datasets generated during and/or analyzed during the current study are available from the author on reasonable request and respondent's permission.

Ethic approval and consent to participate

This research is part of a larger project which was approved by the Ethics Committee of the University of Seychelles prior to securing the funding. Also, respondents consent was sorted and confidentiality was ensured prior to the interviews.

Competing interest

The author declare no competing interests.

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Figures

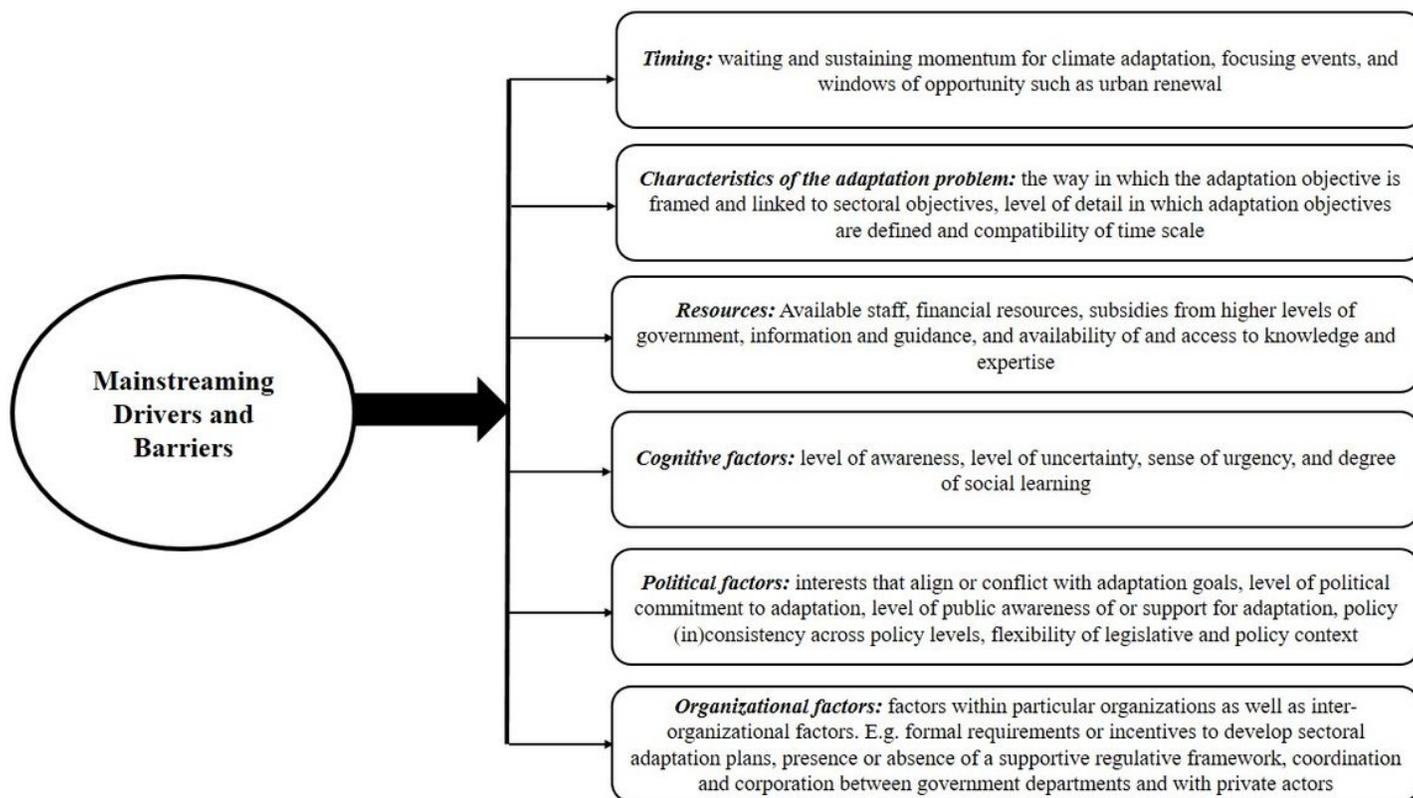


Figure 1

Drivers and barriers for effective climate adaptation mainstreaming.

Source: Inspired by previous studies [3,13,17,21].

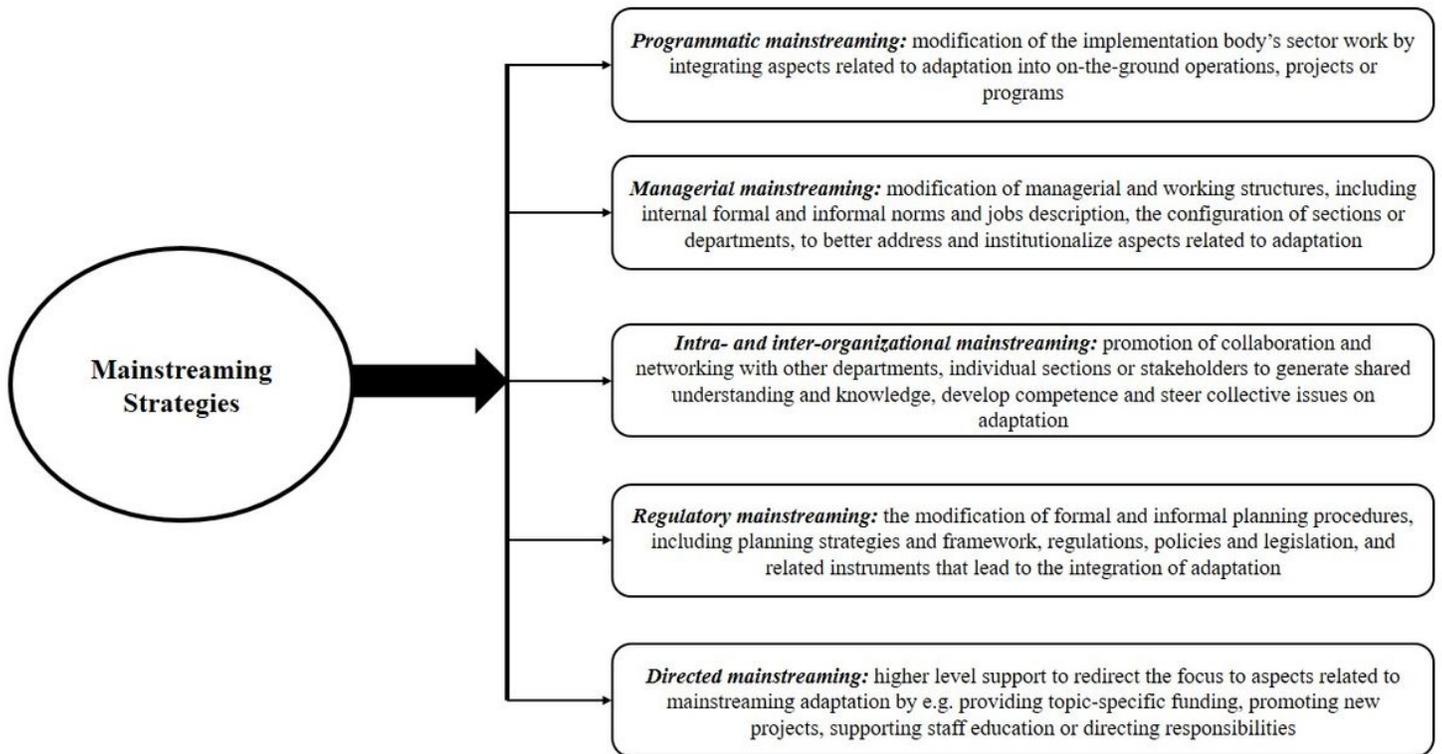


Figure 2

Mainstreaming strategies for adaptation to climate change

Source: Adopted from Wamsler and Pauleit [17].