

GIVRAPD Working Paper Seychelles

Title: Identifying and lifting climate adaptation barriers in Seychelles using a participatory approach

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Abstract

Purpose: The purpose of this working paper is to present an innovative and participatory methodology to identify and overcome climate adaptation barriers and an example of its application in Seychelles.

Design/methodology/approach: The approach builds upon stakeholder mapping (i.e. Net-Map) and uses barrier and practical actions cards to support stakeholders through the process of identifying together potential adaptation barriers and potential actions that can be implemented to overcome them. The approach was used in workshops in four Small Island Developing States (SIDS): Jamaica, Mauritius, Seychelles and St Lucia. In each island, the workshops involved national and local level actors from three sectors: agriculture, fisheries and tourism.

Findings: In Seychelles, the methodology highlighted the preponderance of the national ministries and agencies in planning climate adaptation and the still limited inclusion of local actors in planning or implementing adaptation actions. It also allowed the identification of adaptation barriers, all linked to a lack of climate change evidence and data related to climate change vulnerability. Practical actions to overcome this, point towards the creation of an institutional set up for climate change data collection and the establishment of a national adaptation office to coordinate and implement research and monitoring activities that would involve all stakeholders in collecting data and sharing knowledge.

Originality/value: The participatory identification of adaptation barrier and how to overcome them could be a successful planning process that reconciles national adaptation policies with the implementation of local adaptation actions. It involves different stakeholders devising solutions that not only are in the line with national adaptation policies but also are a step towards reducing vulnerability against climate extremes at local level. Prioritising the identified barriers that are surmountable and

that can already be addressed within the islands' capacities would be the beginning of building climate resilience at national and local level.

Introduction

Small Islands Developing States (SIDS) are particularly vulnerable to the effects of climate change due to their limited size, geographical dislocation, proneness to natural hazards and external shocks, high exposure of population and infrastructure and limited adaptive capacity.

Although SIDS are among the least emitters of GHGs, they are likely to suffer strongly from the adverse effects of climate variability and change and could in some cases even become uninhabitable. Additionally existing and forthcoming challenges related to climate variability and change are just some of many pressing problems that most SIDS face. Their socio-economic concerns include poverty alleviation, high unemployment, and the improvement of housing, education and health care facilities – all of which often compete for the slender natural and financial resources available.

Adaptation measures are central to addressing the challenges posed by climate variability and change (CV&C) in SIDS. But under their existing circumstances, adaptation will require innovative solutions involving stakeholders across different geographical scales and sectors and the integration of adaptation into existing sectoral policy initiatives in areas such as sustainable development, planning, disaster prevention and management, integrated coastal management, and health care.

But some barriers still persist and the implementation of adaptation actions at local level remains scarce. This paper presents an innovative, participatory methodology to identify these adaptation barriers as well as potential ways to overcome them. This methodology was used successfully during a workshop in Seychelles, and covered 3 sectors of activities: agriculture, fisheries and tourism. The results from the workshop are summarised here along with some recommendations on next steps.

Background

Since independence in 1976, the per capita output in this Indian Ocean archipelago has expanded to roughly seven times the pre-independence, moving the Seychelles into the upper-middle income group of countries (CIA, 2014). Traditionally the economy of the island was based on plantations with cinnamon, vanilla, and copra as the main exports. In the 1960s, about a third of the working population worked at plantations, and a fifth worked in the public or government sector. While the tourism and industrial fishing industries were on a roll in the late 1990s, the traditional plantation economy atrophied. Despite attempts to improve its agricultural base and emphasise locally manufactured products and indigenous materials, Seychelles continues to import 90% of what it consumes; the exceptions are some fruits and vegetables, fish, poultry, pork and beer. In an effort to increase agricultural self-sufficiency, Seychelles has undertaken steps to make the sector more productive and to provide incentives to farmers. Much of the state holdings in the agricultural sector have been privatised, while the role of the government has been reduced to conducting research and providing infrastructure.

Tourism and fisheries (fishing and fish processing) are now the economy's two major pillars. In 1971, with the opening of the Seychelles International Airport, tourism became a serious industry, basically driving the economy into tourism. The tourism sector paid better, and the plantation economy could only expand so far. The plantation sector of the economy declined in prominence, and tourism became the primary industry of Seychelles. Tourism now accounts for 25% of GDP, 25% of employment, and 70% of foreign exchange earnings (World Bank, 2014). From 2012 to 2013, the economy registered a growth of 11% in tourist arrivals from Europe, the main tourism market (World Bank, 2014).

Given Seychelles' economic dependence on tourism, any future climatic changes that impact the country's biodiversity, coastline, coral reefs, fisheries and other tourist attractions may significantly impact its development. A study of six major tourism sites in Seychelles found that the country's tourism sector is "extremely vulnerable" to external economic and environmental disasters, but that an aggressive approach to conservation may help to mitigate some of these impacts (SNCCC, 2009).

Seychelles enjoys an Exclusive Economic Zone (EEZ) of almost 1.4 million square kilometres in one of the world's major tuna fishing grounds. Tuna fishing and processing, accounts for close to 5% of GDP, about 7% of jobs, and around 35% of export goods, despite impacts of piracy, environmental factors and increased regional competition between fishing ports and processing plants (World Bank, 2014). Earnings are growing annually from licensing fees paid by foreign trawlers fishing in Seychelles' territorial waters. Privatisations of the Seychelles Tuna Canning Factory in 1995 and of some port operations thereafter have been accompanied by a fall in trans-shipment fees and an increase in efficiency, which sparked a recovery in port services following a drastic fall in 2009.

A changing climate is already challenging the Seychelles' agriculture, tourism and fisheries sectors and communities' livelihoods; recent climatic accounts for the country indicate that the climate around the country has already begun to change over the past few decades. The country warmed by 0.25°C between 1972 and 1997 and its annual rains increased between 1972 and 2006. Additionally, from 2002 to 2006, five cases in which sea levels exceeded the average by 10cm were recorded - an increase that caused significant damages to infrastructure when accompanied by storm events (SNCCC, 2009).

As an SIDS with highly populated low-lying coastal areas, Seychelles is particularly vulnerable to the impacts of climate change. Climate projections to date have focussed on the island of Mahé, where the majority of the country's population is based (more than 90% of Seychelles population and nearly all of its economic activities are concentrated in the narrow coastal zone of Mahé island). Projections reveal uncertainties around the magnitude of future change in precipitation on the island; it is anticipated that the dry season will be drier whilst the wet season will be wetter. Annual sea level rise (SLR) is anticipated to be within the range of 0.4m to 0.6m during the 2070 to 2100 period, a change that would challenge the recovery of Seychelles' coral reefs that are anticipated to decline over the next 40 years (SNCCC, 2009). However, whilst recent assessments make use of both global and regional circulation models in anticipating the effects of climate change, the Seychelles' recent National Climate Change Strategy notes uncertainty associated with current climate scenarios given the country's very small geographic size (Hove et al., 2011).

In 1992 the government of Seychelles established a National Climate Change Committee to provide broader coordination of the development and implementation of national climate policies. In 1998, the Seychelles Meteorological Centre established a climate centre, which has contributed to a number of studies understanding historical meteorological data. Seychelles has prepared an Initial National Communication under the UNFCCC that was released in 2000 and is in the process of developing its Second Communication. In addition Seychelles put in place a 10-year Environmental Management Plan (2000-2010) that addressed how the country's environment was to be managed across 13 thematic areas; climate change was a cross-cutting theme in the plan. The Seychelles Sustainable Development Strategy 2011-2020 produced by the Ministry of Environment and Energy is considered to be a much more comprehensive and overarching document than the Environmental Management Plan it replaces. It provides a clear roadmap where environmental integrity, social equity and economic growth are in tune with each other. There has also been considerable input from the civil society sector that has a one-stop information website hosted by the Liaison Unit of Non-Governmental Organisations of Seychelles (LUNGOS). The government also released in 2009 its National Climate Change Strategy that lays out the policy actions that the government could carry out to address climate change in relation to both adaptation and mitigation (Hove et al., 2011).

As a small island and despite institutional and other economic, financial and technological challenges, Seychelles is committed to confront and address the challenges posed by climate variability and change (CV&C). Efforts are still needed to mainstream climate adaptation considerations into key institutional/ sectoral goals, to improve inter-ministerial collaboration and to link national adaptation policies with local implementation of adaptation actions and overcome some adaptation barriers.

Adaptation barriers referred to here are defined as “any condition that makes it difficult to achieve progress towards adaptation” (Huang et al., 2011) or as “obstacles that can be overcome with concerted efforts, creative management, change of thinking and related shifts in resources, land use institutions etc.” (Moser and Ekstrom, 2010).

Limits to climate adaptation differ from barriers as they are absolute obstacles that render adaptation to climate change ineffective and as such cannot be overcome (Adger et al. 2007). However, barriers to climate adaptation differ from limits in that they are obstacles that can be overcome with (Moser and Ekstrom 2010).

Adaptation barriers are expected to constrain how adaptive capacity to future climate change might be translated into action (Ford and Pearce, 2010) and deeply influence the likelihood of successful adaptation strategies at local level (Burch, 2010). Understanding the nature of barriers to climate adaptation is important (e.g. Patt and Schroeter 2008; Adger et al. 2009; Nielsen and Reenberg 2010) and even more so to find strategic ways of overcoming them. Current understanding of these barriers in SIDS is however very limited. This paper summarises the results from the participative assessment of barriers to climate change adaptation in Seychelles. It also presents some of the implementable practical actions devised by sectoral stakeholder groups to overcome these barriers. The assessment of the barrier and the formulation of practical actions follow a unique participative methodology presented in the next section.

Methodology

In trying to gain a better understanding of the possible barriers underlying the disconnect between national adaptation policies and local implementation of adaptation actions in the specific context of Seychelles and how to overcome them, a one-day workshop was organised. Before the workshop, some desk studies were carried out to better understand the context of the island.

The workshop formed an integral part of the GIVRAPD project. The CDKN project: "Global Islands' Vulnerability Research, Adaptation, Policy and Development" is a 2-year research project in 4 coastal communities in the Caribbean (Jamaica and St Lucia) and the Indian Ocean (Mauritius and Seychelles). It seeks to understand the multi-scale socio-economic, governance and environmental conditions that shape vulnerability and capacity to adapt to climate change.

The workshop in Seychelles included representatives of local organisations as well as national organisations, covering 3 sectors identified as most vulnerable to climate impacts: agriculture, fisheries and tourism. Three main activities were planned throughout the workshop, bringing the participants together within one sector. The first group activity was to identify the existing stakeholders involved in adaptation planning implementation for one of the sector and to assess 'horizontal' and 'vertical' linkages/relationships between the various stakeholders. The linkages captured were: a) information/advice, b) funding and c) line of command/authority. The activity also looked at the influence of each actor on the implementation of adaptation activities at local level. The stakeholder mapping methodology used for this activity dwell from the Net-Map protocol (Schiffer E., 2007).

The second activity of the workshop aimed to: i) gain a group consensus on the critical barrier related to the implementation of adaptation measures for a sector and ii) identify the underlying causes behind the chosen barrier. The groups had access to a list of possible barriers and possible causes and were invited to prioritise one barrier they thought was the most significant for the sector. Each group had to fill one "adaptation barrier" card detailing the chosen barrier (i.e. name of the barrier, cause, organisation/person responsible for the barrier and who could lift the barrier). The groups were also free to come up with their own "off-list" barriers and causes or modified the ones from the lists.

The last activity aimed to identify strategies and actions that could contribute to overcome the causes driving the adaptation barrier identified in the second activity. The groups had access to a list of possible adaptation good practice actions but were also free to come up with their own. Each group had to fill in one "adaptation good practice action" card per barrier identified. The emphasis on the adaptation good practice action" card was on the implementation and feasibility of the action(s) chosen (i.e. who is responsible to implement the adaptation action, how, the resources needed and measures of the effectiveness of the action).

The second and third activities iteratively referred to the stakeholder maps devised at the beginning of the workshop to try and identify the actors that are responsible for the barriers and those who can lift the barriers (sometime the same, sometime different). The two activities, using "adaptation barrier" and "adaptation good practice

action” cards were developed as a practical application of Moser and Ekstrom (2010).

The advantages of using stakeholder participation in the assessment of barriers and formulation of practical actions are many folds. Firstly, involving stakeholders into drawing the network maps allows them to visualise how their organisation or themselves fit into the network. Then, all stakeholders present during the workshop can express their opinions in-situ and these can spark further discussions between participants, thus enabling reaching consensus on the adaptation barriers identified and the possible ways to overcome them. Furthermore, bringing different stakeholders from different backgrounds, communities, literacy proficiencies together allows them to bring their points of view across and possibly clarify opinions and ideas.

A lot of consideration was given during the workshop to appease ethical worries that participants might have had. For example, as participants expressed their concerns over their discussions being recorded, no notes were taken during their group discussions throughout the workshop. In not doing so, collecting additional information might have been compromised but the authors felt that respecting the wishes of the participants was of greater importance.

Results

Agriculture sector

The participants for the agriculture groups were representatives from an international conservation initiative (i.e. Mangroves For the Future), national ministries (i.e. the Ministry of Investment, Natural Resources and Industry), national agencies (i.e. the Seychelles Agricultural Agency, the Water & Sewerage Division of the Public Utilities Corporation and the Small Enterprise Promotion Agency) as well as local farmers.

The network of actors for the agriculture sector, represents the Seychelles Agriculture Agency (SAA), the Ministry of Investment, Natural Resources and Industry, the Ministry of Finance and local farmer associations as well as local farmers as having the most connections with other actors across different geographical levels. None of these stakeholders were however mentioned as having the highest influence over the implementation of adaptation actions at local level.

The actors noted to have the highest influence in the network were international organisations (i.e. the FAO and Regional Economic Communities such as the Common Market for Eastern and Southern Africa or COMESA, the Southern African Development Community or SADC and the Indian Ocean Commission or IOC), some national ministries (i.e. Ministry of Environment and Energy, Ministry of Finance, Ministry of Foreign Affairs, Ministry of Land Use and Housing, Ministry of Community Development, Social Affairs and Sports), national agencies (i.e. National Planning Authority), the Development Bank of Seychelles (DBS) and District Administrations and Local Members of the National Assembly.

Of lesser influence are some of the international agencies (e.g. the International Crops Research Institute for the Semi-Arid Tropics or ICRISAT, The World Vegetable Center or AVRDC, the Alliance for Commodity Trade in Eastern and Southern Africa

or ACTESA, the Centre for Agricultural Research and Development in Southern Africa or CCARDESA and the French Agricultural Research Centre for International Development or CIRAD), national stakeholders such as the SAA and national ministries (i.e. Ministry of Natural Resources and Industry, the National Disaster Risk Management (DRDM) from the Ministry of Environment and Energy, the Ministry of Education), the Seychelles Meteorological Services, national NGOs (e.g. Sustainability for Seychelles), national insurance companies, LUNGOS, local actors such as the SAA Local Extensions (SAALEs), the farmers associations and the farmers as well as the Seychelles Agricultural and Horticultural Training Centre (SAHTC). The only actors earmarked with no influence were the local home gardeners.

Provision of information exists from international to national organisations; for example the FAO and CCARDESA provides information to the SAA and National NGOs give information to CIRAD and international financing partners.

The flows of information are very well distributed at the national and local levels on one hand and amongst the national and local levels on the other hand. At national level the flow of information includes the national ministries (Ministry of Investment, Natural Resources and Industry, Ministry of Finance, Trade and Investment, Ministry of Environment and Energy, Ministry of Foreign Affairs, Ministry of Education, Ministry of Land-Use and Housing), the Seychelles Meteorological Services, the National Planning Authority, the DRDM, National NGOs and LUNGOS.

At local level, the information is well spread among the different actors. The farmers associations, the SAALEs and the District Administrations seem to be the turntable of information at local level, for the information coming from national level. Farmers are well connected to other actors both at national level (to SAA and DRDM) and local level (to the SAA local extensions, farmers association, SAHTC and local NGOs).

Funding for adaptation originates mainly from international organisations and then is channelled to the Ministry of Finance, who then redistributes it mainly to other ministries and national level actors (e.g. Seychelles Meteorological Services, DRDM, MIUH) but also some local level ones (i.e. District Administrations and local farmers). Some funding from international actors is also directed to local actors such as farmer associations and local NGOs, probably through specific projects. The SAA provides funding directly to SAALEs and LUNGOS to local farmer associations. It is also interesting to note the mention of national insurance companies as providing funds to the local farmer associations.

SAA and the Ministry of Finance initiate the line of action in this network. SAA influences national level actors such as the Ministry of Investment, Natural Resources and Industry, the Ministry of Environment and Energy and at local level the District Administrations, local NGOs, farmer associations, local farmers, and local members of the National Assembly. The Seychelles Meteorological Services influence the DRDM who initiates actions in the SAA and the Ministry of Community Development, Social Affairs and Sports and the District Administrations. Looking at this network it seems that channels are already in place to implement adaptation actions from the top down and ones that reach local stakeholders.

The participants in this group chose not to use the barrier suggested in the existing list of barriers. Instead they made their own barrier that they defined as: "Agriculture is not considered as a priority sector because it brings limited foreign exchange as an economic sector". As such the participants expressed their views that only limited

considerations are given to the sector, which has implications for the island's food security. To lift that barrier, the group also came up with their own practical action that is to advocate for the role of agriculture in food security. To implement this practical action, national ministries were found to have a key role (i.e. the Ministry of Investment, Natural Resources and Industry, the SAA, the Ministry of Health, the Ministry of Community Development, Social Affairs and Sports).

Fisheries sector

The group working on the fisheries sector included representatives from RAMSAR, the Seychelles Fishing Authority, the Seychelles Port Authority, the Seychelles National Parks Authority and the Seychelles Chamber of Commerce & Industries. No local fishermen or representatives from local fishermen association were present.

The actors with the most connections to other actors in the network is the Seychelles Fishing Authority, who was also found to have high influence over the implementation of adaptation actions. Other actors with high influence are the Seychelles Investment Board, other national ministries (i.e. Ministry of Investment, Natural Resources and Industry, Ministry of Environment & Energy, Ministry of Finance), the Seychelles Maritime Safety Organisation, the Seychelles Fishing Authority and the Seychelles coastguards.

Of lesser influence are international organisations (e.g. UNESCO, Indian Ocean Tuna Commission, International Maritime Organisation), international funding sources (e.g. EU, FAO), international fishing companies, the Island Development Company (IDC), the Seychelles National Park Authority, the Development Bank of Seychelles, the Seychelles Port Authority, the Seychelles chamber of commerce and industry, Seychelles Petroleum (SEPEC), the Regional Anti-piracy Prosecution & Intelligence Co-ordination Centre (RAPPICC), the national insurance companies and all local actors (i.e. local fishermen, local artisans, local fish accessories shops, local support services, local divers, local boat builders, local consumers, local hotels and restaurants, local fish retailers). The local shipping agents, ship handling companies, ship handlers, yacht clubs and local boat owner associations are noted to have no influence.

It is important to remark that connections between the national and local levels for all flow types in this network are scarce. But this might be explained by the absence of local level representatives in the workshop group, who could have shaded more light on local stakeholder involvement.

At the heart of the information exchange are the Ministry of Investment, Natural Resources and Industry and the Seychelles Fishing Authority. Information from international organisations flows to national ministries (i.e. the Ministry of Investment, Natural Resources and Industry, the Ministry of the Environment and Energy). A lot of information is exchanged at national level between the ministries and the Seychelles Investment Board, the Seychelles Maritime Safety Administration, the Seychelles Fishing Authority, the Ministry of Finance, Seychelles Port Authority, Seychelles National Coast Guards, SEPEC. Information to the local level is scarcer and comes mainly from national level; the national and local insurance companies seems to provide the only flow of information to local actors such as local fisherman, divers, mariners, suppliers, local artisans (local shops).

International donor organisations (e.g. EU, FAO) as well as the Seychelles Investment Board give funding to the Development Bank of Seychelles who then directs it to the Seychelles Fishing Authority. Surprisingly no funding links were noted between other national ministries and national actors.

The Seychelles Fishing Authority provides funding to a small selection of local actors (e.g. mariners, divers, local fishermen) but not to any of the other local actors mentioned in the network (e.g. local fish retailers, local ship companies, local boat owners, etc.).

The Seychelles Maritime Safety Administration initiates action in the Seychelles Port Authority and the Seychelles Fishing Authority. The Seychelles Fishing Authority then prompts local actors such as local fishermen and local divers. A link is also noted from the Seychelles Fishing Authority to the SEPEC. The Seychelles Port Authority instructs the ship handling companies and the ship agents. The Seychelles Coast Guards and the RAPPICC also share a reciprocal line of action.

For this group, the principal barrier of implementation of adaptation actions at local level was identified as the lack of evidence and data related to climate change vulnerability. Underlying this barrier are poor communication of climate change science, perceptions of uncertain scientific data and projected impacts, conflicting data resulting in lack of decision-making, no data collection system and lack of human resources. The Ministry of Environment and Energy was seen as responsible for this barrier. To overcome the barrier identified, the group prioritised the practical action: "Create an institutional set up for climate change data collection" that should be implemented by the Seychelles National Climate Change Committee.

Tourism sector

Representatives from the Seychelles Meteorological Services, the Seychelles Tourism Board, the NGO Sustainability for Seychelles, the international conservation initiative Mangroves For the Future, the Small Enterprise Promotion Agency, the National Assembly and LUNGOS were in the group working on the tourism sector.

The Ministry of Environment and Energy and the cabinet of ministers are the two most predominant stakeholders in the network, having the most connections to the other actors.

Apart from the cabinet of ministers and the Ministry of Environment and Energy, who have high influence over the implementation of adaptation actions at local level, are the District Authorities, the National Planning Authority, the Ministry of Tourism and Culture and the DRDM. The local media surprisingly also was noted to have high influence in the network.

Found to have less influence are international organisations (e.g. IUCN, World Bank, UNDP/GEF, Météo France, NOAA, WMO, Japan International Cooperation Agency or JICA), national ministries (i.e. Ministry of Foreign Affairs), national agencies and organisations (e.g. Seychelles Fishing Authority, the Island Development Company, the Seychelles Hospitality and Tourism Association or SHTA, the Seychelles Meteorological Services, the Seychelles Tourism Board, Destination Management Companies, national NGOs and local actors (e.g. local artisan fishermen, local coastal population, local hotel owners, local diving operators, local catering businesses). No actors were found with no influence.

The network has a predominance of national actors. Local level actors are not very well connected to national and international level actors; flows of information, funding and command are mainly concentrated at the national level with a few exceptions for the flow of information.

Information is exchanged between international organisations and national actors; Météo France (Reunion), the World Meteorological Association, NOAA exchange information with the Seychelles Meteorological Services on one hand and the Ministry of Environment and Energy on the other hand. The Japan International Cooperation Agency (JICA) is also providing information to the Ministry of Environment and Energy.

At the centre of the information network at national level is the Ministry of Environment and Energy (MEE); it receives information from and provides information to national as well as local actors. National actors connected to the MEE are the Ministry of Tourism and Culture, the Ministry of Foreign Affairs, the Island Development Board, the Island Development Company, the National Planning Authority and the Seychelles Meteorological Services. The MEE exchanges some information with local hotel owners, local diving operators and local boat operators.

As noted above, the local media was found to be of high influence in the information network, receiving information from the DRDM and giving information to the Island Development Company, who then informs the Ministry of Environment and Energy. The Ministry of Tourism and Culture exchanges information with other national actors such as national NGOs (e.g. Nature Seychelles and Sustainability for Seychelles) as well as the Seychelles Tourism Board and the SHTA. The SHTA and the Destination Management Companies (DMCs) exchange information between them and that is then passed on to local hoteliers, local diving operators etc. Information is also cascaded down to local coastal populations via local and national NGOs and CBOs.

Funding comes mainly from international actors (e.g. World Bank, EU, IUCN, UNDP/GEF, JICA) and international hotel chains and is directed to The Ministry of Environment and Energy as well as national and local NGOs. Some funding from the Small Enterprise Promotion Agency are directed to local NGOs but no further outgoing funding links are reaching the local level.

There is a clear indication that the line of command is initiated by the cabinet of ministers, then spreads to other national actors such as the Ministry of Environment and Energy, the Ministry of Tourism and Culture, the Ministry of Foreign Affairs, the National Planning Authority, the Island Development Board, the Island Development Company. The Ministry of Environment and Energy instructs the Seychelles Meteorological Services and the DRDM. The Seychelles Tourism Board prompts local actors to action (i.e. the local hotel owners, the local diving operators, local catering businesses). Again local level actors do not seem to be given enough considerations and being engaged in the line of actions.

For this group, the principal barrier of implementation of adaptation actions at local level was identified as lack of evidence and data related to climate change vulnerability (lack of monitoring data, climate data and projections). Underlying this barrier are perceptions of uncertain scientific data and projected impacts, conflicting data resulting in lack of decision-making. The Ministry of Environment and Energy (MEE) was seen as responsible for this barrier. MEE was also seen as the actor who

could implement the practical action to overcome the barrier namely establishing a national unit / adaptation office to coordinate and implement research and monitoring activities with flexible and simple decision-making tools involving all stakeholders in collecting / storing data and sharing knowledge.

Discussion

The three sectoral groups all pointed towards the importance of the national ministries and agencies in the networks. Not only were they among the most well connected stakeholders, they also were amongst the ones with the highest influence over the implementation of adaptation actions.

Information seems to flow well between all national actors for the three networks and between national and local levels for the agriculture sector but not reaching local levels as well for the fisheries and tourism sectors. Information tends to be generated mainly by international and national organisations and then cascading down. Farmers receive information from a variety of sources whereas for the local actors in the fisheries and tourism networks, access to information is more limited.

International organisations are consistently identified as the main sources of funding for adaptation in the three sectors. The funding from international sources is mainly directed to national ministries and especially the Ministry of Finance as well as the Development Bank of Seychelles. Funding seems to be remaining mainly at national level. It also seems to become scarcer when reaching the local level for the fisheries and tourism networks but be a bit more consistent for the agriculture network.

The line of action remains predominantly at the national level across the three networks. The agriculture network did include several local level actors in the line of action but the fisheries and tourism networks presented local actors as more isolated from the line of action, with few links reaching out to them from the national level.

Two of the chosen barriers are knowledge-orientated; both the fisheries and tourism groups identified the lack of evidence and data related to climate change vulnerability as their main barrier for adaptation. The Seychelles' National Climate Change Strategy also outlined the need to overcome the lack of climate change knowledge as one of its strategic objective (i.e. "To advance understanding of climate change, its impact, and appropriate responses"). This barrier/ strategic objective could be overcome by implementing the practical actions devised by the groups, i.e. to create an institutional set up for climate change data collection and establishing a national unit / adaptation office to coordinate and implement research and monitoring activities with flexible and simple decision-making tools involving all stakeholders in collecting / storing data and sharing knowledge. Groups pointed to the Ministry of Environment and Energy (MEE) and the Seychelles National Climate Change Committee as the entities to implement these practical actions.

Interestingly the agriculture group devised their own barrier, i.e. that agriculture is not considered as a priority sector because it brings limited foreign exchange as an economic sector. The participants felt that not enough consideration was given to ensuring food security on the island. As a substantial portion of the food is imported in Seychelles and in the face of limited hard currency, the island is in a precarious position with respect to food security. Additionally, a greater frequency of extreme weather events such as heavy rainfalls that continuously contribute to soil erosion

and soil fertility losses could exacerbate the degradation of agricultural soils thus threatening agricultural production and hence future national food security.

The group also pointed out that unless there is political will and support from other stakeholders (public and private), agriculture will not be prioritised. In order to gain political will, participants mentioned that climate science (physical data) could be used to convince and get a buy in from politicians. Again this is pointing towards the barrier identified by the other groups and that is linked to a lack of climate change evidence and perceptions of uncertain scientific data and projected impacts.

Practical actions to promote the involvement of various stakeholders are already taking shape; the Liaison Unit of Non-Governmental Organisations of Seychelles developed an information website that seeks to eventually be a one stop information provider about Civil Society in Seychelles. As it already exists, this website could be built on further to include and disseminate information about climate change to other stakeholders. Additionally, one of the mandates of the Seychelles National Climate Change Committee is to maintain national and relevant international climate change information (inventory) at the National Climate Change Information Center located at the Meteorological Services. The Seychelles Meteorological Services was noted as an information provider in the networks but its connections were directed only to national level actors. The capacities of the Seychelles Meteorological Services could therefore be strengthened and include more efforts to communicate climate change to all stakeholders, not only at national level. The local media was also found to be of importance in communicating risks from extreme events. An exploration on how the influence of the media could be used to advocate about climate change and make climate information more accessible to all could also be explored.

Another key issue highlighted by all workshop participants was that decision makers tend to forget who they are working for i.e. the local farmers and fishermen. These are the groups that tend to get side-lined and get the least benefits from the decisions made yet they are the ones physically involved in the implementation of local adaptation actions.

Participants realised through drawing the networks and their different flows that so far adaptation is mainly in its planning phase and confined to the national level; there is no or little provision to include the local level in the planning nor is there much evidence of implementation at local or national levels apart from isolated initiatives and projects. Additionally, funding is still mainly used for planning with little left for implementation.

These observations brought by the workshop participants show that they have a good understanding about what is going on in Seychelles regarding climate adaptation. But rarely do they get together to discuss issues; one of the main feedback of the workshop was how much they appreciated to have had the opportunity to be brought together. The methodology developed for the workshop is easily reproducible and do not require a high level of expertise in climate change or climate adaptation. It also provides a structured way to get the participants to interact with each other, identify potential barriers and devise possible practical actions to overcome these barriers.

Workshop participants were able not only to identify barriers but also come up with implementable solutions. This demonstrates that participants had a real commitment

in building consensus to address specific issues in the island. And the strategies are ready to be utilised. This takes the exercise beyond 'barriers' to readiness to implement solutions.

The key message is that some of the barriers that are identified through the process presented here can already be overcome by looking at the consensus solutions proposed by the workshop participants. Implementing them should first try to take advantage of the islands' existing capacities. Involving national and local stakeholders into overcoming these barriers will also contribute to develop communities of practice on adaptation in Seychelles. This second step has not so far been implemented but would be a very interesting process to follow-up with.

Conclusion and future research

National governments do play a crucial role in the governance of adaptation as they are seen as key actors that can intervene and confront existing barriers by changing policies or providing additional resources (Ford and Pearce, 2010, Measham et al., 2011). But they are also reported to constrain local bottom-up initiatives on adaptation (Amundsen et al., 2010, McNeeley, 2012).

The participatory identification of adaptation barrier and how to overcome them could be a successful planning process that reconciles national adaptation policies with the implementation of local adaptation actions. It involves the different stakeholders in devising solutions that not only are in the line with national adaptation policies but also are a step towards reducing vulnerability against climate extremes at local level. Prioritising the identified barriers that are surmountable and that can already be addressed within the islands' capacities would be the beginning of building climate resilience at national and local level.

The majority of studies on barriers use small and inductive case approaches while comparative studies across different contexts are limited. Applying the methodology outlined here to further case studies, beyond the 4 SIDS covered in the GIVRAPD project might reduce this gap and build on the existing knowledge pool.

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