



Meeting the challenges to climate change adaptation: an NGO community-based successful projects in Mauritius

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Abstract Climate change and anthropogenic pressure are among the main drivers of coastal environment degradation in Mauritius, a small island developing state. Globally, mitigation and adaptation strategies applied to the complex socio-ecological coastal systems offer effective solutions in curbing the adverse impacts. In environmental protection, Non-Governmental Organisations' (NGOs) role was first recognised in the 1992 UN Agenda 21 for Sustainable Development, and they are now integrated with most coastal environmental rehabilitation programmes. This paper describes two climate-based adaptation projects undertaken about a decade ago by an NGO in Mauritius. The projects were community-driven in all phases of implementation. The first project focussed on the Ecosystem-based-adaptation (EbA) approach of restoring a mangrove ecosystem and improving community life at Le Morne Village. The second project aimed at the rehabilitation of a historical site and the consolidation of a degraded coastline at Poudre d'Or Village. Components of 'hard' and 'soft' adaptive measures were applied as pathways to guide project implementation. The projects required extensive field visits, focus group interviews, and participatory inputs from all stakeholders. A 10-year assessment of the processes applied in the conceptualisation,

implementation, and in evaluating the outcomes was gleaned from regular visits to local inhabitants, stakeholders, and NGO members since the completion of the projects. In 2022, an informal interview at Le Morne and a survey at Poudre d'Or showed that both projects resulted in positive outcomes. Good governance capacity and rigour in the management of the project team were highlighted as crucial attributes to the success of the projects.

Keywords Climate change · NGO · Mangrove · Adaptive capacity · Governance · Communities

Introduction

Climate change and socio-economic development pressures are known to impact adversely on the coastal environment and the livelihood of vulnerable communities of small island developing states (SIDS) (Mycoo, 2015; Nunn & Kumar, 2018; Hay, 2013; Hadi, 2018; De Souza and Clarke, 2018). These challenges are currently addressed through mitigation and proactive adaptation strategies (Powell et al., 2019) within the complex framework of socio-ecological systems (Salguero-Otero & Ojea, 2020). Such systems are dynamic, and therefore liable to be further disturbed by external pressures including global climate change (Basel et al., 2020; Cutter et al., 2008; Folke et al., 2016). Consequently, coastal communities will have to adapt continuously to changing

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environmental conditions. Adaptation strategies involve structural solutions, for example, building coastal flood defenses, or non-structural ones with nature-based solutions such as restoring mangrove ecosystems to protect coastal habitat. This approach known as ecosystem-based adaptation (EbA) (UNEP, 2019) has been practised as a key adaptation strategy in many traditional societies long before it became a common concept for addressing the threat of climate change on socio-ecological systems.

In Mauritius, most coastal communities' livelihood depends primarily on tourism and artisanal fishery activities (Ministry of Environment, 2003; Naidoo et al., 2010). Over the years, increased human activities and severe weather perturbations have had a detrimental effect on coastal resources and the vulnerability of coastal communities (Chacowry et al., 2018). The frequency and severity of such impacts are projected to increase in the foreseeable future (IPCC, 2022) as climate change takes a stranglehold globally. Top-down centralised approaches to coastal management have proved to be effective only to a certain extent in view of the inconsistencies of the institutions concerned, and their incapacity to integrate community concerns and demands in decision-making in developing countries (Anisimov et al., 2020). In response to the failures of centralised approaches, and the lack of transparency and community participation (Christie & White, 1997; Uddin et al., 2021), greater emphasis has been given to community-based methods in environmental management. It is widely recognised that environmental challenges are best managed when policies and actions reflect the situational realities of affected communities (Delgado-Serano et al., 2017). Hence, the trend of engaging local communities (Shaw, 2006) in addressing the challenges of environmental issues has been growing worldwide.

Community-based approach to coastal management

According to Alcala (1998), community-based management (CBM) programmes were coined as a concept as early as the 1950s but were integrated within coastal management policies in the 1970s. Over the years, the use of CBM has been applied in many

traditional societies. It is argued that its systematic use as a democratic process served as an effective approach to enhancing the adaptive capacity of coastal communities. In the last decades, community-based approaches have proved successful in the effective management of local resources in many developing countries notably in Latin America and the Caribbean (Delgado-Serrano et al., 2017); Thailand (Kongkeaw et al., 2019); Bangladesh (Parvin et al., 2010); Solomon Islands (Abernethy et al., 2014; Basel et al., 2020); and the Caribbean Islands (De Souza and Clarke, 2018).

The popularity of CBM programmes in the 1980s and 1990s led naturally to the participation of civil society, with NGOs having a growing role in the identification, and implementation of community-level projects (Shaw, 2016). Enshrined in the 1992 Agenda 21 on Environment and Development (UN, 1992), NGOs have been recognized as major partners in a community-driven approach to sustainability and in addressing coastal environmental problems from a holistic and integrated perspective (Benson et al., 2001). NGOs are seen to serve as co-managers of projects, foster sound environmental governance practices (Arantes et al., 2020), and empower communities to manage their resources.

In developing countries, projects implemented by NGOs are funded by external agencies or by national foundations in the context of their Corporate Social Responsibility (CSR). In Mauritius, about 50 NGOs, registered with the Ministry of Environment, are involved in environmental and climate-related issues (Ministry of Environment, 2022). It is observed that external funding agencies do not generally sponsor infrastructural development through NGOs.

This paper describes two climate-based adaptation projects of a local NGO, known as the *Association pour le Développement Durable* (2022). It was initiated in 2007 by a group of volunteers from diverse academic and professional backgrounds, both national and international. As a civil society partner, the role of the NGO was to address environmental and climate-based issues. The overall objectives of the two projects implemented by the NGO were to involve vulnerable coastal communities in environmental management with the aim to enhance their adaptive capacity and resilience to the impacts of climate change. Ten years later, an assessment of the

projects was carried out to investigate to what extent the objectives were met.

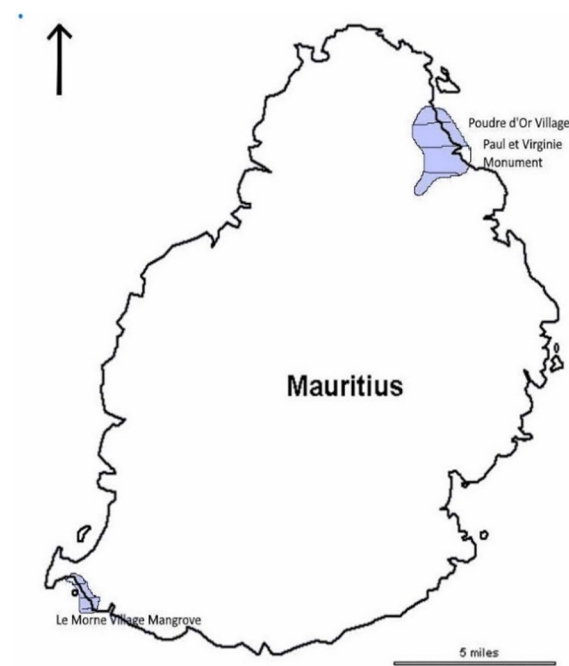


Fig. 1 Map of Mauritius showing project sites shaded in light blue *Source:* environment.govmu.org/(Adapted)

The following research questions were formulated:

- (i) What are the social, economic, and environmental impacts of the projects?
- (ii) How were the overall objectives of the projects met?
- (iii) What are the key components of the NGO’s approach that led to the success of the projects?

Description of project sites

The first project was implemented in the coastal village of Le Morne in the southwest of Mauritius. The second project was carried out in the village of Poudre d’Or on the northeast coast, as shown on the map (Fig. 1).

Le Morne village

Le Morne is a small coastal village, situated at the southwestern tip of the island at the foot of a mountain range that comprises Le Morne Brabant Mountain, a UNESCO World Heritage site (Fig. 2).

The village has an area of about 21.5 km² and faces a narrow strip of sandy beach. Further west

Fig. 2 Map of Le Morne village (Shaded patch indicates mangrove restoration site) *Source:* Michelin.com (modified map)



lies a large expanse of alluvial plain locally known as Bassin Léon which acts as a catchment area for debris during rainy seasons. In 2011, the village had a population of 1,378 with a density of 64.1 inhabitants/km² (Statistical Office, 2011). The local population consisting mainly fishers and daily wage-earners were found to be economically disadvantaged. In 2008, the village was among the least developed among the 145 villages in Mauritius. The project was undertaken from 2008 to 2012 and was primarily focused on a nature-based approach, generally known as the Ecosystem-based-adaptation (EbA) approach. It required the restoration of a mangrove ecosystem over the bare alluvial land which was washed by the sea during high tides.

Within the overall aim to build the adaptive capacity of the community to climate change, the specific objectives of the project were to:

- (i) Establish a mangrove ecosystem on a denuded and swampy coastal area, locally known as Bassin Léon, and
- (ii) Undertake awareness programmes on environmental issues and enhance the adaptive capacity of the community.

The plantation of mangroves was undertaken in four stages 2008 (1 ha), 2010 (2 ha), 2011 (3 ha), and 2012 (2 ha). Table 1 illustrates the range of activities associated with adaptive measures during the implementation phases of the project. Today, the mangrove plants have matured, and they constitute one of the largest mangrove ecosystems on the island.

Poudre d'Or village

The coastal village of Poudre d'Or is situated north-east of the island (Fig. 3).

It has an irregular coastline that is susceptible to erosion to high waves. The population was about 4142 (Statistical Office, 2011) over an area of 8.4 km², with a population density of 493.1 inhabitants/km². The occupation of the inhabitants is diverse including fishers, artisans, labourers, and office workers. The village is known for its historic St. Géran Monument (also known as *Le Mémoire*) which was threatened by erosion. The surrounding site was in a dilapidated state and was no longer attractive to

visitors. For over 25 years the villagers had been calling for the improvement of the coastline and for the restoration of the Monument site. These issues were taken up as a project by the NGO from 2009 to 2012.

Within the overall aim of climate change adaptation, the specific objectives of the project were to:

- (i) Rehabilitate and consolidate some 600 m of eroded coastline
- (ii) Restore the Monument and redesign, landscape, and rehabilitate the surrounding area, and
- (iii) Undertake awareness programmes on environmental matters

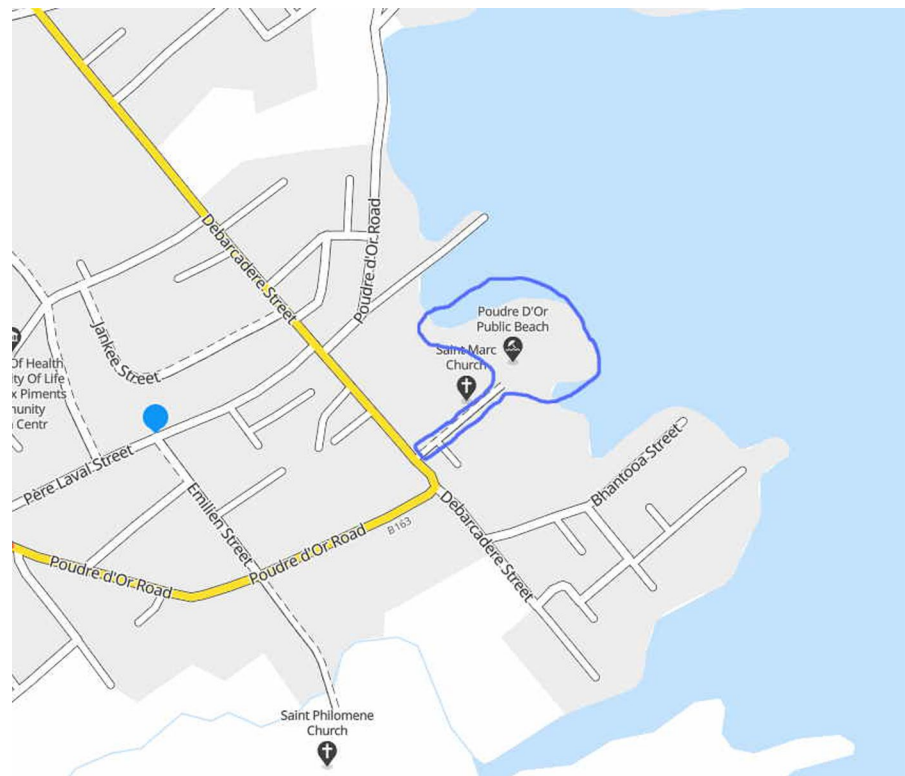
A follow-up of both project sites was occasionally carried out through visits by the stakeholders and NGO members. Some 10 years after the completion of the projects, an assessment was conducted to evaluate the social, economic and environmental benefits of the projects.

Methodology

The approach used to answer the research questions necessitated field work and contacting the inhabitants of the two project sites, some of the main stakeholders, and a review of the few available media coverages. However, due to the prevalence of the Covid-19 pandemic that started in 2020 and personal contact restrictions, fielding survey questionnaires proved to be a major challenge. The survey method used was adapted to the specific situation of each village.

Le Morne village is small with few inhabitants. Informal interviews were found to be the most appropriate approach for the survey. In June 2022, a member of the NGO who had been visiting the area regularly contacted members of the village for an informal interview on the social, economic and environmental aspect of the project. Nine persons were randomly selected and interviewed in the local community village hall and at the project site. The conversations lasted a couple of hours and were recorded in the local language on a video clip and the NGO member took some notes. Extracts from the video clip and the notes were used in writing this paper. The interviews and the notes provided insights into how the project had brought changes

Fig. 3 Map of Poudre d'Or village with project site outlined. Source: <https://www.google.com> (modified)



in the social, economic, and environmental aspects of the village.

At Poudre d'Or, a participant who was formerly involved in the project activities volunteered to survey at the household level. A structured questionnaire was designed, and it included both close- and open-ended questions on personal background, family welfare, and social, economic, and environmental impacts of the project. Some 50 householders were selected randomly, as discussed with the researcher. They were surveyed using the telephone from January 2022 to March 2022. Responses from 38 households were collected and the data were e-mailed over to the researcher for analysis.

Results of the 10-year assessment

At Le Morne Village, information from the recorded video clip and the notes taken in June 2022 that were found to be relevant to the assessment were extracted and analysed. A couple of quotes indicate that the project had a positive impact on their social

life and provided the inhabitants with local subsistence and brought in some financial benefits. As quoted by one participant:

The mangroves are grown now and have brought lots of benefits. In the past, the coast was bare, and nothing grew on it but now, the mangroves bring us a lot of crabs and shrimps. As an inhabitant of this village, I earn something by selling out some of these products.

The site is visited by tourists, sightseers, and by schoolchildren from schools around the island. It is an important source of bait for fishers and offers protection for the coast against erosion and the lagoon against pollution. As observed by an influential member of the village on environmental issues:

In the past, the debris such as mud and leaves brought down by the rivers from the mountains nearby was swept into the lagoon. The mangrove forest retains the debris and protects our lagoon from being polluted.

At Poudre d'Or Village, the questionnaire survey carried out between January 2022 and March 2022 gave the following results (Fig. 4).

Responses from the 38 households indicate that the highest scores referred mostly to the economic and environmental aspects. Most of the households perceived that the project provided economic resources. Some small business ventures, such as food and local craft stalls have been set up by local community members at or near the site, generating household income. About 70% of households claimed that the project raised awareness of the problem of erosion and the impact of climate change. Around 65% of the households noticed a change in village life and that the restoration of the coastal area gave aesthetic value, and national recognition. However, only 20% of those surveyed replied that they were aware of the activities of the NGO in their area.

NGO's approach and implementation strategy

Materials referring to the approach and implementation of the projects were retrieved from the NGO's website (<http://www.addmauritius.org>), national archives, local newspapers, and traditional accounts of villagers. A set of adaptive measures was formulated to guide all activities for each village during the implementation phases as shown in Table 1 and Table 2. The *hard* adaptive measures referred to the infrastructural and engineering aspects while the *soft* adaptive measures focused on the sociocultural, economic, educational, and sensitisation aspects of

community development. Collaboration and inputs of stakeholders and partners are summarized in Tables 3 and 4.

Project implementation strategy at Le Morne

An important aspect of the strategy was to associate all concerned parties, local as well as national. The strategy resulted in considerable voluntary support. The major ones are listed in Table 3.

Regular visits and contacts with participants in the project were given priority to assess whether the projects were sustainable and brought benefits to the coastal community. The pictures show the original swampy area (Fig. 5) and later the same area planted with young mangrove plants (Fig. 6).

Project implementation strategy at Poudre d'Or

The strategy was to ensure the collaboration and input of stakeholders and partners. It resulted in considerable voluntary support as shown in Table 4.

The District Council, the Beach Authority, and the local people who participated in the project have continued to maintain their interest in the site and ensure that the authorities keep the site clean and the public facilities in good stead. The pictures below show the degraded site a decade ago (Fig. 7) and the site after consolidation (Fig. 8) at Poudre d'Or.

Fig. 4 Responses in the household survey at Poudre d'Or *Source:* Author's survey

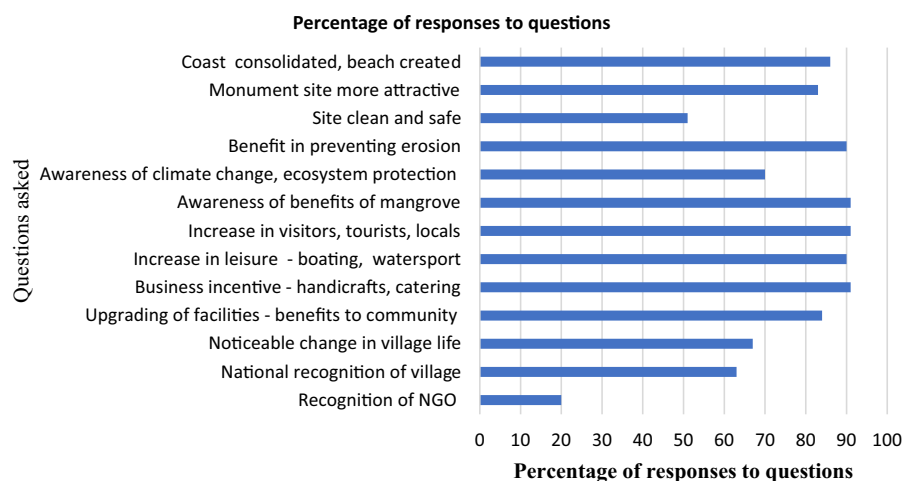


Table 1 Activities associated with the hard and soft adaptive measures at Le Morne Village

<i>Hard adaptive measures</i>	
Infrastructure	Associated activities
Consolidating the degraded mangrove ecosystem	Survey and design of the site to accommodate 80,000 mangrove seedlings
Establishing a mangrove ecosystem	The plantation was undertaken in four stages 2008 (1 ha), 2010 (2 ha), 2011 (3 ha), and 2012 (2 ha)
<i>Soft adaptive measures</i>	
Socio-cultural, economic, environmental, and educational elements	Associated activities
Enhancing social activities	Workshops and talks to inhabitants on sustaining coastal resources
Promoting education and awareness	Educating primary school children on environmental issues. Setting up a Nature Corner and provision of books for children on environmental issues
Communication	Development and dissemination of information materials on environmental issues of local relevance

Table 2 Activities associated with the hard and soft adaptive measures at Poudre d'Or Village

<i>Hard adaptive measures</i>	
Infrastructure/Engineering	Associated activities
Rehabilitation and protection of 600 m of coastline against erosion	Designing of site. Consolidation of walls and planting of mangrove seedlings
Creating a beach of 2000m ²	Survey, design, and creation of the beach
Landscaping and greening of 2000m ² of space around the Monument	Designing, landscaping, and greening; and building public facilities and amenities and a lighting system
<i>Soft adaptive measures</i>	
Socio-cultural/economic elements	Associated activities
Promoting socio-cultural activities	Participation of local communities in socio-cultural and entrepreneurial activities
Undertaking capacity building and promoting ownership	Participation in the awareness-building campaign on sustainable management of coastal resources
Encouraging economic activities to promote tourism	Promotion of local crafts and cuisines for tourists and visitors
Undertaking wide publicity of the Monument and other historical sites	Interviews and newspaper coverage of the projects in the media

Discussion

Perspectives on social, economic, and environmental benefits

The 10-year assessment, as described in "[Results of the 10-year assessment](#)" section, was an important measure to identify the state of the coastal environment, and its social and economic benefits following the implementation of the projects. The informal interviews at Le Morne and the survey at Poudre d'Or highlighted positive outcomes and the decade-long benefits brought to the communities at both project

sites. The project objectives were specific to each coastal village and were based on their coastal profiles and the nature of environmental problems. These issues were addressed within the overall objectives of adapting to climate change.

The results of the informal interviews at Le Morne indicated that the projects had brought significant social, economic, and environmental benefits. The established mangrove plantation at Le Morne generated an ecosystem that provided local subsistence and income to the inhabitants. As perceived by a local interviewee, the mangrove plants trap incoming debris and safeguard the beach and the lagoon from pollution,

Table 3 Partners and their contributions to the Le Morne project

Stakeholders and partners	Input
Black River District Council (regional authority), Village Council, and Le Morne Community Centre	Support to the organisation of workshops in decision-making and post-project follow up
Funding by EU and MCB Forward Foundation	Allocation of funds
Ministry of Lands and Housing	Authorisation to use land and provision of the mapping of the site
Ministry of Agro-industry Albion Fisheries Research Centre (AFRC)	Giving talks on mangroves and provision of propagules
Community and NGO members	Planting of some 80.000 mangrove seedlings over 8 ha of swampy land
Enhancing capacity building of the community	
Development Bank of Mauritius, and Local Fishers' Association	Undertaking an awareness campaign on funding and credit facilities to the fisher community
Ministry of Cooperatives, and Small Enterprises & Handicraft Development Authority (SEHDA)	Undertaking to raise awareness of the community on women's empowerment and decision-making, insurance schemes, marketing, and sustainability issues
Experts from Agricultural Research Unit (AREU)	Provision of training on compost making
Ministry of Social Security	Giving talks to women and elderly persons on social benefits and aspects of sustainable development in society
Ministry of Education, Mauritius Institute of Education, Parents Teachers' Association, and Ministry of Agro-industry	Making presentations on natural resources and coastal protection Undertaking the development of a Nature Corner with local plants

Table 4 Contributions of partners to the Poudre d'Or Village project

Partnership/Stakeholders	Input
The Beach Authority	Design of site and installation of public amenities
Funding agencies	Provision of funds by the EU
Ministry of Environment and Sustainable Development, Ministry of Local Government, Ministry of Agro-industry, and the District Council	Authorization and approval to undertake project activities Provision of support in implementing the project
Forestry Service	Provision of 200 endemic plants and fruit trees to inhabitants
Poudre d'Or Village Council	Participation in all project activities and support to households' survey
Ministry of Education, Mauritius Institute of Education, and Parents Teachers' Association	Support the environmental awareness of schoolchildren of the locality
Local Fishers' Association, Women's Group, Members of socio-cultural groups, and Local NGOs	Active participation in all activities Tree planting and organizing socio-cultural events The organisation of local fairs and festivities at the Monument site
Religious leaders	Participation in cultural and religious ceremonies
Police and Coastal authorities	Ascertaining security during various events
The Meteorological Services, and Mauritius Oceanographic Institute	Provision of scientific information on meteorological and oceanographic conditions Sensitisation and dissemination of information and services
Private sector and individuals	Supply of materials for infrastructure and hard components

Fig. 5 Swampy coastal site at Le Morne (taken in 2008) *Source:* ADD website (www.addmauritius.org)



The vegetation, once grown, would act as a protective shield against erosion during high waves and strong winds. At Poudre d'Or, the results of the questionnaire survey indicated that the project brought about social change. Participation in the project reinforced community cohesion. Most of the inhabitants appreciated the restoration of the degraded coastal area and perceived that the change had given an aesthetic value and national recognition to their village. The coastal area

has become an attractive leisure ground for tourists and visitors from other parts of the island.

In Fig. 4, the low score given on the non-recognition of the NGO could have been influenced by two factors. First, the survey was conducted on a random sample and only a few of those who replied to the questionnaire may have been aware of the activities of the project. Secondly, the notion of NGO and how it functions are not well understood by the local

Fig. 6 Same site planted with mangrove. (2012) *Source:* ADD website (www.addmauritius.org)



Fig. 7 Degraded coastline in Poudre d'Or (2009)
 Source: www.addmauriti.us.org



population. Any activity accomplished in a constituency of the island is commonly believed to be the work of the central government.

Factors that contributed to the success of the projects.

The major factors that contributed to the success of the project, as obtained from visits, interviews and surveys, include the availability of NGO expertise,

participatory learning process and inclusiveness of all sectors of the communities.

Participatory learning: a process-based approach

The adaptive strategy adopted by the NGO in its implementation process involved the *hard* adaptive measures and the *soft* measures along with its associated activities summarised in "[Project implementation strategy at Le Morne](#)" and "[Project implementation strategy](#)"

Fig. 8 The same site after restoration (2012) Source: www.addmauriti.us.org



at Poudre d'Or" sections. The range of activities was carried out in phases and embraced the techniques of 'process-based' and of 'learning by doing'. The process-based approach involved participatory learning as a fundamental strategy for sustainable development (Bagheri & Hjorth, 2007). The technique of 'learning by doing' (Yin et al., 2018) instilled a spirit of ownership and a commitment to preserving the coastal resources. These approaches triggered the process of social learning to address environmental challenges to climate change adaptation (Ensor & Harvey, 2015).

Participatory learning processes facilitated the exchange of ideas between experts from stakeholders and the local communities who had situational knowledge of their history, culture, environment, and society. Sharing of local knowledge had helped in raising awareness, fostering empowerment, and improving resilience to the impact of climate change (Chaudhary et al., 2011; Naess, 2013; Reyes-García et al., 2016; de Scally & Doberstein, 2021; Nagy et al., 2014). The ideas and learnings from all stakeholders were integrated into all management processes through consultative and advisory meetings, workshops, and sensitisation programmes on project implementation.

Inclusiveness of all sectors of the coastal communities

Special attention was given to the needs and concerns of women as they were the most concerned with the welfare of their families. School children were given training in sustainable development, and on the ocean, coastal and marine resources. A few specific features of the projects included the provision of facilities for the disabled and the elderly. The presence of politicians and leaders from all faiths at review workshops and closing ceremonies of both projects reinforced cohesion and promoted a democratic process in project implementation. The youth of the regions were given special attention in conjunction with the Ministry of Youth. Elderly persons who had contributed to the development and transformation of the villages over the years were closely associated with socio-cultural activities. Fishers were included in the Project Management and Implementation Committees as they were seen to be the most sensitive to any transformation of the coastal regions. The inclusion of local communities in the Committees bestowed them with ownership, empowerment, a sense of authority

in decision-making, and the opportunity to voice their concern to the authorities and the local media.

The key components of the NGO's approach to the success of the projects

A solid management structure comprising members skilled in scientific, and social disciplines and in project management ensured cohesion and trust among varied partners and enabled the timely and effective execution of the activities. In addition, several factors contributed to the success of the project, in particular the rigour of governance and inputs from external partners.

Governance

The Project Management Committees served as valuable tools in coordinating effectively and in reporting in a timely manner on the very wide range of activities undertaken. The NGO assumed the overall responsibility towards the funding agency, partners, and local communities. Studies have shown that the practice of good governance is crucial to the success of a community-based management project (Yildirim and Ayna, 2018; Carmin, 2010; Iqbal et al., 2020). Features of good governance include *effective leadership* (Hailey & James, 2004; Ritvo et al., 2018), *trust*, *transparency* and *accountability*, *impartiality*, and *inclusiveness* (Uddin & Haque, 2020). These elements were provided by the sturdy management structure put in place. The management system involved local communities and stakeholders. It provided for transparency and accountability in the use of resources on agreed activities and target groups. Trust and confidence (Kettle et al., 2016) were both vital attributes to dissipating uncertainties, building self-confidence, enhancing motivation, and willingness to share. The element of trust reinforced by good governance imparted a sense of confidence among the partners and the funding agencies.

Input from external partners

External funding agencies did not generally fund infrastructural development through NGOs, but the projects were among the few which benefited from such an allocation. Funds from agencies were equitably and judiciously used to acquire materials and make payments. Collaboration and input of partners resulted in

considerable voluntary support to the funding of activities and in awareness raising. Transparency, accountability, and communication of the expenses encouraged stakeholders to willingly contribute additional resources to the project (Tables 3 for Le Morne and 4 for Poudre d'Or). Following the completion of the activities, the remaining resources were spent usefully in a transparent manner in additional sensitisation activities and in useful activities such as the provision of books for underprivileged children.

Addressing the challenges

There were several challenges that had to be addressed during the project's lifetime. For example, rivalry appeared between local community groups in the choice of activities and in the allocation of wages. These conflicts were resolved through consultations arranged by NGO members. They ensured that the nature of the issues was well understood and that the points of view of each group were respected and considered within the context of the project. Other challenges included constraints imposed by major funding agencies, insufficient project lifetime for attitude change, limited opportunities for replication, and inadequate resources for follow-up after completion.

However, beyond the lifetime of the projects and the closing events, the NGO continued to meet and support the communities though no additional resources had been available. It had also inculcated a sense of ownership among the inhabitants to safeguard and maintain their environment at both project locations. At Le Morne, the Ministry of Agro-industry and the Albion Fisheries Research Centre (AFRC) had taken the responsibility of overseeing the mangrove plantation. At Poudre d'Or, proper maintenance of the beach and public facilities were taken up by the local authorities, the District Council, and the Beach Authority. Over the last 10 years, the two sites have been well maintained and have been integrated into the local structure. However, new initiatives by the local inhabitants are required to continue the improvement of the sites and build greater awareness in light of new environmental challenges.

Conclusion

This article describes the processes applied to two projects in underprivileged settings with different

social, economic, and environmental situations. Both projects were NGO-driven, community-based, and supported by the authorities and partners, and had similar overall objectives of enhancing resilience and capacity building to the impact of climate change. The projects were undertaken through a methodology that embraced the concept of 'learning by doing', improved community knowledge, wide participation by stakeholders, and raised awareness of the community on the impact of global climate change.

The Le Morne project applied the Ecosystem-based-adaptation (EbA) approach focusing on the establishment of a mangrove ecosystem and on poverty alleviation. The project at Poudre d'Or involved structural expertise in coastal consolidation, restoration of cultural heritage, and landscaping. A 10-year appraisal of the sites showed that the communities had become more aware, had developed capacity, and had been maintaining their environment while enhancing their authority in policymaking. The beneficial outcome and the success in implementing complex projects for the benefit of local communities are attributed to good governance with the committed participation of local communities and all stakeholders within a given period. A major outcome was the ability of the two villages to address climate change through adaptation, raise sustainability and resilience, and reduce vulnerability.

The role of the NGO as a driver opened new pathways in the local participation of communities in implementing Government policy on adaptation to climate change. The linking of NGO interventions to the local government activities and incorporating their experience and know-how into policies would ensure sustainability and replication of innovative efforts to other parts of coastal communities in environmental governance. Such an approach would pave the way to strengthen climate change adaptation.

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Declarations

Conflict of interest The author declares to have no known competing commercial interests that could have appeared to influence the work reported in this paper. I declare that the above statements are true.

Ethical approval I declare that the work reported in my manuscript is objective and transparent. As such, I have no personal affiliation or financial interest mentioned in the manuscript.

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