

Climate Compatible Development: Legal Implications in the Coastal Zone and Inclusive Development for Mauritius

Roshan T Ramessur^{1*}, RP Gunpath² and Taruna S Ramessur³

¹Department of Chemistry, Faculty of Science, University of Mauritius, Reduit

²Department of Law, Faculty of Law and Management, University of Mauritius, Reduit

³ Department of Economics and Statistics, Faculty of Social Studies and Humanities, University of Mauritius, Reduit

Abstract

Climate change impacts as well as coastal development affect the livelihoods of the coastal communities mainly the fishermen, agriculturalist and farmers who are highly dependent on the coastal resources to earn a living. There is at present a need to strengthen coastal zone management to cater for climate change impacts as well as to provide room for inclusive coastal development so that the main economic sector (tourism), highly dependent on coastal resources, continues to flourish but not at the cost of the livelihoods of the coastal communities. At the same time coastal resources have the characteristics of “a common good” so that property rights issues become prominent and legal implications have to be taken on board. Given the nature of the topic, the authors will deal with it from a multidisciplinary perspective, with highlights from the natural science, legal and social lenses. With facts and figures they will rely on secondary data and relevant legislations to demonstrate the importance of coastal management to foster inclusive development in the fragile economies of Small Island Development States (SIDS) with particular reference to the Mauritian case study. What shall come out of this paper shall eventually achieve public consciousness to sustainable coastal inclusive development for a better *Maurice Ile Durable* (MID).

Keywords: Coastal Management; Climate Change; Convention; Socio-economic Development

Introduction

The Republic of Mauritius consists of a main island, Mauritius, which lies approximately 20.17°S and 57.33° E and the total land area is 2040 km² whilst the maritime exclusive economic zone covers an area of about 1.9 million km² extending from latitude 10°S to 20°S and from longitude 55° E to 75°E. Mauritius is situated on the south rim of the Mascarene Plateau with an area of 1865 km² and a length of coasts reaching 160 km surrounded completely by fringing coral reefs and enclosing a lagoon area of 243 km² (Figure 1). The island has no continental shelf proper, the water reaching a depth of 3000 metres within 20 km of its coastline. The limits of the EEZ of Mauritius (1850 km², 20°S, 58°E, South Western Indian Ocean, 1.3 million inhabitants) have been defined by geographical coordinates through subsequent regulations under the Maritime Zones Act 1977 as the Maritime Zones (EEZ) Regulations 1984. Mauritius has proclaimed its Territorial sea (12 nm) through the Territorial Sea Act of 16 April 1970, its Exclusive Economic Zone (200nm, about 1.9 million km²) and has also defined its continental shelf through the Maritime Zones Act 1977 and has joint jurisdiction with Seychelles of an extended continental shelf (ECS) of 396 000 km² beyond 200nm as recommended by UN Commission on the Limits of the Continental Shelf (UNCLCS) in 2011. The coastal conditions in Mauritius of coastal waters have declined since 2000 as the Mauritian economy underwent major structural changes successfully with a rapid phase of industrialization in the 1980s. The threat of contamination of coastal waters in Mauritius and deterioration in water quality by eutrophication and industrial wastes, in particular, metal pollution have caused a decline coverage of live corals to 10-20% in lagoons around Mauritius in 2013 and exceeding the Redfield ratio for nutrients. Heavily polluted water was found in the lagoons on the coasts of Bain des Dames, Baie du Tombeau, Harbour and Pointe aux Sables in the early part of the first decade of this century (from 2001 to 2003) and on the coasts of Pointe aux Sables, Albion, Bird Sanctuary and Riviere Noire from 2007 on, on the western coast of the island of Mauritius [1]. The potential source of dissolved

nutrients may probably due to the lagoon water being mixed with the submarine groundwater discharge containing nutrients of agricultural and domestic origin in the lagoon [2]. Many of the 49 offshore islets are biologically important and have conservation potential due to their unique native and endemic flora and fauna.

Despite local legislations to protect both the environment and the economy of Mauritius, its fragile ecosystem may also be jeopardised with dangers coming from outside with maritime pirate attacks on tankers provoking oil leakage and other dangerous, toxic and hazardous waste products harmful from petroleum tanks to beaches and coastline. Important increases in the level of copper, zinc and lead in urban and estuarine sediments due to traffic have been found in Mauritius and other studies have also related concentrations for zinc, copper and other trace metals to anthropogenic point sources or to discharges from urban areas with correlations between different metals between lead and zinc [2-15]. Alongside coastal communities tend to be the worst victims of climate change as they are more prone to coastal hazards such as sea level rise which may result in inundation (submergence) of low-lying wetland and dryland areas, erosion, salt water intrusion, increased risk of flooding, storm damage and in extreme circumstances even to dislocation of the population and change in livelihood. In this paper, the authors discuss climate compatible development in the coastal zone from a multidisciplinary perspective, with highlights from the natural science, legal and social lenses. With facts and figures they

***Corresponding author:** Roshan T Ramessur, Department of Chemistry, Faculty of Science, University of Mauritius, Reduit, Tel: +230 403 7511; E-mail: ramessur@uom.ac.mu

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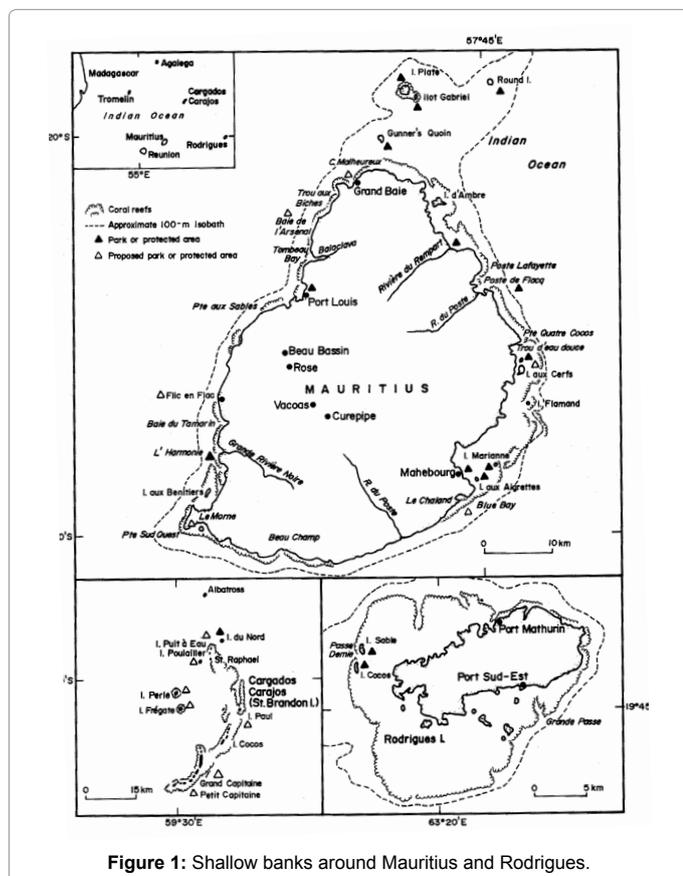


Figure 1: Shallow banks around Mauritius and Rodrigues.

will rely on secondary data and relevant legislations to demonstrate the importance of coastal management to foster inclusive development in the fragile economies of Small Island Development States (SIDS) with particular reference to the Mauritian case study to achieve public consciousness to sustainable coastal inclusive development for a better *Maurice Ile Durable* (MID).

Climate Change and Coastal Vulnerability in Mauritius

The coastal zone of Mauritius was redefined in 1997 in the Environment Protection Act of to include all islets within the EEZ. Mauritius has also ratified and adhered to international law or legal instruments (*infra*). Baseline investigations carried out on the west coast at Case Noyale of Mauritius have highlighted the susceptibility of oligotrophic water bodies to nutrient inputs and the threats posed by rapidly increasing residential and industrial development. Pollution of oligotrophic systems in Mauritius is a real problem and in-depth monitoring of this issue is of vital importance. Pilot Studies on coastal vulnerability and climate change at Pointe aux Piments, Riambel, Quatre Soeurs and Case Noyale, Mauritius have been carried out in 2012. The coastal zone is being viewed as one complex multidisciplinary entity with the various conflicting uses and activities taking place within the zone. There is an urgent need to further protect sensitive marine and coastal areas besides coral reefs such as wetlands. Islets, seagrass beds and mangroves and encourage the use of environmentally cleaner technology in industries including the recycling of wastes.

An African Strategy on Climate Change was developed by the African Union Commission and adopted by Ministers in 2013 in Johannesburg. Management strategies aimed at climate change

compatible development have to be based on a fair knowledge of what is going on in the natural systems. Management strategies aimed at climate change compatible development have to be based on a fair knowledge of what is going on in the natural systems. Countries in the South Western Indian Ocean are affected mostly by hazards and disasters, namely, floods, mass movements (e.g. erosion, landslides and siltation), heat waves, wildfires, tropical cyclones, tsunamis, swells and dust storms. The ultimate objective is to minimise the damage costs, make accurate assessments of losses due to hazards and disasters including the minimisation of vulnerability associated with urbanisation, and prediction of the effect of climate change on hazards and disasters [16-20]. Flash floods are becoming more frequent with floods in 2008 and more recently in February and March 2013 with a death toll of 11 in Port-Louis. Reef degradation due to coral bleaching events in 1998 and 2009 in Mauritius have impacted on the two common socio-economic reef based activities, namely fisheries and tourism. In 2013 the tourism industry attracted more than 950 000 tourists annually and the capacity of the new airport which opened in September 2013 will handle about 4.5 million passengers annually.

Climate compatible development opens up new opportunities for interdisciplinary and transdisciplinary research, teaching and engagement with communities, policy makers and practitioners for low carbon and climate resilient development [16,17,21]. Geographic Information System (GIS) softwares are nowadays used for Environmental Sensitivity Index (ESI) map compilation and production [18-20]. In a Mauritian example the use of GIS has gained more importance in the planning process and is providing information for sensible policy-making as GIS is facilitating the improvement of the inventory of present and planned land-use and the related impact assessment of proposed developments allowing to develop and visualize coastal threats as generated by Reef base, a global information system for coral reefs (Figures 2-4). Based on this kind of information Coastal Zone Management is an adaptive process of resource management for environmentally sustainable development. The NCCAPF enabling framework has been designed to address key barriers such as lack of financing options, lack of institutional framework, and low levels of adaptation technology transfer and aims to integrate and mainstream climate change into core development policies, strategies and plans of Mauritius. The long term energy Strategy 2009-2025 aims to meet 35% of the energy demand through renewable energy sources by the year 2025.

Related Legal Issues for Coastal Sustainable Development and a *Maurice Ile Durable* (MID)

Are our coasts protected from floods, earthquakes and tsunamis?

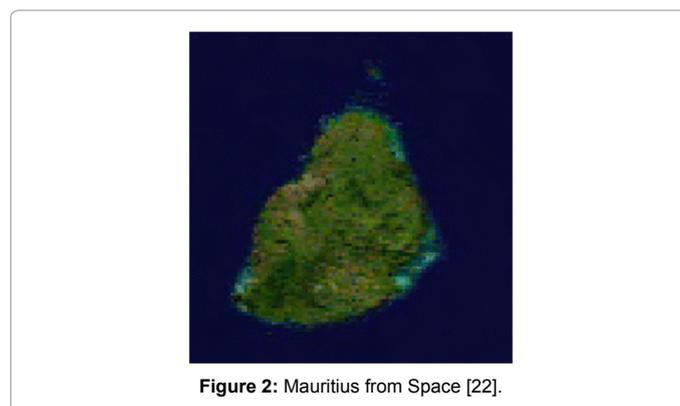


Figure 2: Mauritius from Space [22].



Figure 3: Location of Coral Reefs around Mauritius [22].

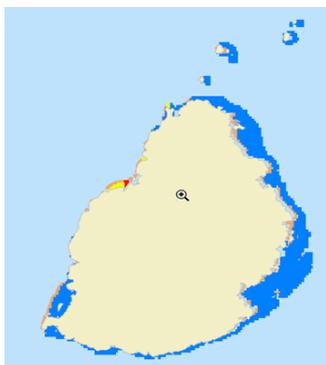


Figure 4: Marine Pollution (Code: Blue- Low Threat, Yellow-Medium Threat, Red-High threat, Burgundy-Very High Threat, Black-Critical) [22].

Natural disasters are not so natural than it really seems. Indeed, it is left undisputed that natural disasters have been caused and provoked by globalisation and industrialisation in both developed and developing countries with the destruction of the natural habitats of the fauna and flora worldwide [23-24]. Both the Bonn Convention of migratory species of wild animals 1979 and the Ramsar Convention aim to preserve terrestrial, marine and migratory species and their habitats [25].

And we are paying it in a very costly way with the emission of GHG which have very serious impacts on lands, sea and coasts so precious for the SIDS in their socio-economic development (tourism, hotels, job creation and foreign investments) [26]. Even if its EEZ encourages fishing and exportation of the harvest of the sea nevertheless it not denied that there are dangers and menace against coastal sustainable development ahead. Apart from coastal sustainable management it is also important to know what the Mauritian legislature has responded to overcome these menace, threats and danger.

In a nutshell, the Mauritian legislator passed the Wetlands Act and has signed and ratified the Ramsar Convention to protect our wetlands. Since Mauritius is gifted with natural reservoirs, indigenous forests, coastal reefs, unspoiled lagoons, dormant volcanoes and unlimited beaches around the coasts there is a strong need to protect them for the present and the future generations to come and to generate income for a developing country that aim to be a 'tiger' in the Indian Ocean. However, like elsewhere, wetlands and coasts are destroyed either by natural disasters and human interventions. One main reason behind it is that there is still a lack of human unconsciousness and it may account for this.

Wetlands (Terre Rouge, Baie-du-Cap, Pointe d'Esney) and Mauritius Blue Bay Marine Park, natural reservoirs like Mare-aux-Vacoas, indigenous forests, unspoiled lagoons, dormant volcanoes must be protected and there are sufficient legislations to make Mauritius *une île durable* (MID). Motivations and support for a MID must be part and parcel of our ideologies coupled with a sense of awareness. And as Gandhi rightly pointed out: 'Be the change you want to see in this world'.

Furthermore, the Finance Bill 2008/2009 provided for an Attractive, Modern, Inclusive, Green and Open Mauritius (AMIGO). There shall be a MID Fund which will replace the National Energy Fund. The object of the new fund is to protect the environment through recycling, encourage more efficient use of energy and to increase reliance on renewable energy. In addition, the Finance Bill has considered a number of main projects in order to reduce pollution on the island which would eventually contribute to a reduction of climate change. However, in order for the MID scheme to succeed, measures should also be taken to strengthen the institutional and legal framework relating to all sectors which are concerned with this scheme, for instance, the energy sector.

Conscious of climate change and the impact of green house gases (GHG) on its socio-economic development Mauritius reacted promptly and signed and ratified the UNFCCC on 17th August 1992 [27]. And in practically the same length that it has also signed and ratified the Kyoto Protocol on 9th May 2001, which paved the way for protection of the environment with a new principle: 'the polluter pays principle' [28]. Prior to coming into force of the Kyoto Protocol the Vienna Convention for the protection of the ozone layer 1985 warned State members and the international community of ozone depletion by GHGs [29]. But it does not deal with the legal aspects for the reduction of the use of GHGs the Montreal Protocol 1989 aims at controlling the substances which cause the depletion of the ozone layer by identifying the products which emit chlorofluorocarbons (CFCs) such as aerosol spray, solvents, sterilants and proposing alternate substances to CFCs [30].

Now, perpetrators to the environment and the ecosystem must be careful as they shall be punished by penal sanctions in the form of a fine. With the coming into force of the Environment Appeal Act (EAA) the Republic of Mauritius demonstrates to what extent the government is concerned about environment degradation is concerned with the setting up of the Environment Appeal Tribunal. Its statutory provisions provide for standards to protect the quality of air¹ resources shall be prescribed by the Minister of environment. These standards would consider the minimum essential air quality, the control of the concentration of substances in the air and also the control for atmospheric pollution². Moreover, there are also the Air (Ambient and Emission) Standards (GN 105 of 1998). The EPA 2002 also provides for the Environmental Impact Assessment³ which is required to be able to commence an undertaking.

There is one issue which is non debatable in this particular context: environment, climate change and global warming are of universal concern. The temperature is increasing annually and by 2050, if no precautions have been made, the temperature will be around 40°-50°C according to some predictions. Human intervention is the first to blame and once more nature and humanity will be in such turmoil, havoc and disorder that poverty will affect most countries of the

¹Section 3 of EPA 2002 provides that for the purpose of this Act; "air" includes ambient or localised air within a building, a vehicle, or within any enclosure or a structure.

²Section 40 of EPA 2002 - Standards for air

³Part IV of the EPA 2002

world. Developing countries will be the most affected by tsunamis and other natural disasters but it does not mean that developed countries shall be spared (USA and Japan are often affected by hurricanes and earthquakes).

Coastal Management Development and International Law

Has international law contributed to coastal management development? There are various international covenants and other cooperation agreements which favour of course development without specifying directly or any link with coastal management development [31-33]. Anyway, Mauritius has signed and ratified most of these international legal instruments (ICESR 1966 and ICCPR 1966) and related declarations (Stockholm Declaration 1972, Rio Declaration 1992, Declaration on principle of international law concerning friendly relations and cooperation among States in accordance with the Charter of the UN 1970) and cooperation agreements and it is important at this stage to understand their relevance to coastal management development [31-33]. Even military operations and weapons of massive destruction must not be used as they may modify the environment [34].

In 1972, the UN General Assembly established the UN Disaster Relief Coordinator (UNDRO) and by proclaiming the 1990s the International Decade for natural Disaster Reduction (IDNDR) the international community seems to shoulder efforts to combat natural disasters. The proclamation of IDNDR's goals; which "*were to reduce, through concerted international action, especially in developing countries, loss of life, property damage, and social and economic disruption caused by natural hazards*"; is compatible with Article 25 of the Universal Declaration of Human Rights 1948 (those struck by a natural disaster are entitled to certain rights in relation to their standard of living).

However, there is a glimpse of hope with opinion concern and international response though the 'polluter pay principle' provides for sanctions which are not very persuasive indeed. In fact, international law is still soft law despite the fact that the International Court of Justice (ICJ), an international organ for the settlement of international disputes has very good reputations in this field, may impose States to repair damages since the famous case of *Nicaragua v. United States*. Also, some decisions reached by the ICJ has become part of international customary law and, again, some States have refused to abide to the jurisdiction of the ICJ on the ground that both *stare decisis* and *opinion juris* of the ICJ have no binding character but its normative value is, hopefully, welcome by most States.

For State responsibility to perform with efficiency there is a real need of communication both locally and internationally, to manage wetlands so as to enable preservation and tourism opportunities, to develop zones, which may encourage eco-tourism with financial support from the government for sustainable development and donors are encourage to finance projects related to wetlands development. States have the duty to cooperate with each other and to maintain international peace and security to promote international economic stability and progress (Declaration on principle of international law concerning friendly relations and cooperation among States in accordance with the charter of the UN, 1970).

Sense and sensitisation are also both important: education and curriculum development, population awareness, media presentation and communication concerning issues of environment protection are important to enhance community participation. The law must be stricter to polluters by imposing penalties, which are even more persuasive.

And the ratification by Mauritius of the United Nations Convention on the Law of the Sea 1982 (UNCLOS 1982) was to protect its coasts, the marine environment, encourage marine scientific research and the protection of its EEZ against unreported, illegal fishing and maritime piracy [29].

Wetlands cannot survive without water and the ecosystems need hydrological cycles to maintain this tempo. Today, water is scarcer than before in most countries, tomorrow it may become a luxurious product and some African countries are already suffering from desertification (The United Nations took initiatives asking member States to ratify the UN Convention to combat desertification as soon as possible as it is urgent to do so) [35]. It is vital to understand the importance of biological diversity; human activities that provoke nature's wrath, human intervention to modify the environment and that development of hotels on the coasts of the island are restricted where it may set hurdles to wetlands and development of wetland ecosystems. Principle 1 of the Rio Declaration on Environment and Development 1992 provides that "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature".

Some Legal Aspects to Climate Change and Coastal Zone Management and Consequences

Coastal zone management is not an isolated issue. Multidisciplinary, it covers a spectrum of wealth (the local tourism industry is contributing to 8% of our GDP) and desolation (unreported and illegal fishing in our EEZ, maritime piracy, lack of socio-economic development and poverty) as well. The SADC Declaration on poverty eradication and sustainable development earmarked the use of renewable and alternative sources of energy [24].

In the same length, the shrinkage of glaciers in the north or the south is of universal concern. But over and above climate change, even of one degree centigrade, provokes global warming which in turn provoke storms, hurricanes, floods, tornados, floods and droughts. It is not denied that greenhouse effect and global warming contribute to changes in climatic conditions but what is often denied is that States failed to implement its legislations properly. And this explained why these issues were on the agenda of the United Nations Framework Convention on Climate Change, 1992 (UNFCCC) whose main aim is to achieve: "*stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner*" [27].

If the planet is doomed with natural calamities and human caused disasters (wars, conflicts, atomic explosions, chemical weapons and other weapons of massive destructions) in return they encourage diseases to spread and famine. So, there is a time to response promptly otherwise we will pay it in a costly way.

If it is properly managed SIDS may save their beaches, coastal zones and advocate for a better sustainable development which is another plus value for their socio-economic development. Indeed globalisation and profound demographic changes, in view of economic development, are conducive to pollution, air pollution, natural calamities and couple with over exploitation of the land and sea lead to the emergence of floods, droughts, desertification, soil erosion just to

⁴Article 2 of UNFCCC

name a few. The objectives of the Convention on Biological Diversity, 1992 are to prevent deforestation, and the destruction of the fauna and flora including wetlands [36].

The Mauritian government reacted promptly with the coming in force of several and well diversified legislations to improve coastal zone management with the coming in force of the Fisheries and Marine Resources Act 1998, Wildlife and National Parks Act 1993, Rivers and Canals Flow of Rivers Act 1941 in order not to disturb the normal flow of river water to wetlands, and the Wetlands Act just to name a few.

Despite local legislations to protect both the environment and the economy of Mauritius its fragile ecosystem may also be jeopardised with dangers coming from outside. Maritime pirate attacks on tankers may provoke oil leakage and other dangerous, toxic and hazardous waste products harmful from petroleum tanks to our beaches and other coastal lines.

In any way, there shall be policies to enhance environmental protection and wetlands are no way an exception to the general rule. Thus, in a regional dimension there are useful and relevant conventions (Treaty of Economic Community of West African States when it came into force was to control deforestation) in this area. For example, the African Convention on the conservation of nature and natural resources encourages State members to harmonise and coordinate policies in view of achieving ecologically rational programmes and to reduce pollution but just like the Treaty of Pelindaba, for the denuclearisation of the African continent, have not yet entered into force since they have not been ratified yet.

Livelihoods Dependent on the Coastal Resources

Since long time back the coastal zone around the globe has long been privileged for human settlement as it was viewed as an ideal place to search for economic livelihood. In Mauritius also, the same trend has prevailed and as such currently there are competing and conflicting demands for the right to use the coastal zones by the population, tourism industry and property developers. The main sectors which depend on coastal resources for economic livelihood are fishery, agriculture and tourism.

As far as the fishery activities are concerned, they can be categorized as coastal fisheries, banks fisheries and tuna fisheries. According to the Ministry of Fishery, around 11 000 people are employed in the fisheries sector which represents 1.5% of the GDP. Many of the small-scale fishermen due to low collateral and lack of education, tend to be highly indebted (despite the fact that they do get some assistance from the Development Bank of Mauritius (DBM)). At the same time, they are not well organized and as such cannot protect their own interest and this result in lack of coping strategies and a situation of exploitation which has been prevalent for years in the fishermen's environment. Their situation is further worsened by the fall in fish catch arising from pollution and coastal development, especially hotel expansion which does create jobs but for only for some category of people, under which they do not fall. The poor income of the fishermen has in turn led to over-exploitation of lagoon resources, together with the use of harmful fishing techniques, which consequently impact negatively on the coastal resources and environment.

On the coastal zone there are also agriculturist mainly involved in the cultivation of onions and some are also engaged in farming like rearing ducks, chickens, cattle and goats as a buffer against fluctuating income as output from agriculture is never certain and usually threatened by tsunamis, flooding, high tides and water salinity. Given

lack of assets and unstable revenue, those involved in this sector tend to earn a low living and as such tend to perpetuate the use of poor farming practices, which places further strain on the scarce land resources on the coast.

In Mauritius, tourism development took off in the early 1970s and since then this sector has constantly been growing and contributing significantly to GDP, to finally become one of the main pillars of the economy. Tourist activities are clustered along three key coastal zones namely:

- North Zone from Pointe aux Piment to Grand Gaube with 42 km of coastline;
- East Zone from Roches Noires to Trou d'eau Douce with 39 km of coastline; and,
- South West Zone from Le Morne to Flic en Flac with 37 kilometres of coastline.

The expansion of this sector has brought with it many benefits among which is the higher standard of living of the local population. This rise in purchasing power has accordingly led to an increased demand for land in the coastal zone as investment in non-hotel accommodation and informal rental of holiday flats to tourists denoted a new livelihood prospect. However these patchy and sometimes informal land developments triggered injurious effects on the coastal surroundings such as construction on wetlands and natural drains thereby damaging their ecological functions and increasing the probability of floods, "eye sores" in the natural landscape due to lack of planning; poor sewage system resulting in effluents being discharged in the lagoon and hence death of corals and beach erosion which is further aggravated by vehicles and trampling. Other tourist activities which act as a burden on the coastal resources are the leisure activities such as snorkeling and diving, and the use of pleasure crafts which are main sources of coral damage. As noted by Ditton the growth of hotels and bungalows may have been financially viable but have turned out to be irresponsible from a perspective of conservation or preservation and the local community angle resulting in an undesirable impact on coastal resources [37,38]. As mentioned earlier though tourism development is taking place in the coastal regions, yet the coastal community is not benefitting from it as most of the tourists spend their time in and budget on the high quality hotels and most of the employees of these hotels come from regions other than the coastal ones. This clearly shows a lack of integration of the coastal population in tourism development and the bitter reality that the tourism sector has somehow resulted in unfamiliar values having been superimposed upon long established local community's use, whose value depends on coastal resources for their livelihoods.

Alongside coastal communities tend to be the worst victims of climate change as they are more prone to coastal hazards such as sea level rise which may result in inundation (submergence) of low-lying wetland and dryland areas, erosion, salt water intrusion, increased risk of flooding, storm damage and in extreme circumstances even to dislocation of the population and change in livelihood. The acidity of the ocean is another setback which threatens the survival of coral-reef ecosystems. It will decrease the expansion of calcareous algae at the base of the food web and of shell-forming marine organisms (such as scallops), as well as impede the growth of calcified skeletons in many other marine organisms, including marketable fish species. These species alterations will in turn affect local fisheries livelihoods and food supplies for coastal communities. In brief coastal communities around the world are going to experience climate change that will wield multi-

faceted pressures, many of which are already deemed vulnerable to ongoing climatic variability [39,40].

With the above background it is more than obvious that there is a call for an integrated approach to coastal zone management which promotes inclusive and climate compatible development.

Inclusive and Climate Compatible Coastal Management

Coastal zones necessitate appropriate structures and devices for its geographical administration which in line has to cater not only for the physical dynamics of coastal processes, but also the dynamics of people and the places in which they desire to live. The concern is thus how to better manage the multi-dynamic alterations taking place in this transitional zone. Now the focus should not be limited only to environmental considerations but attention should also be paid to social justice so that coastal resources are shared in an equitable way without excluding any group(s) of the coastal population.

Below are some measures and approaches which can foster inclusive and climate compatible coastal management:

- The very first step is to be able to capture the economic and cultural values of coastal resources as well as quantifying the cost of lost services to both current and future generations due to environmental degradation. This will subsequently require appropriate governance structures which have been stressed out in the previous sections on the legal framework of the paper, but will also call for good scientific information to inform decision making and tradeoffs.

- New community resilience options should be initiated and the existing ones should be further built up. It must be noted that both social-ecological resilience and psychological/developmental resilience should be enhanced. The former can involve activities such as planting and monitoring of mangroves; rehabilitation of hatchery and the development of crab/prawn pond and bivalve raft; area fisheries and water quality surveys; geographic information system (GIS) establishment among others while the latter deals mainly with promoting community organization; amplifying demand-driven small-scale community-managed initiatives; improving leadership and teambuilding; promoting participatory management, power structures, and decision-making processes as well as keeping options open and boosting flexibility. These resilience approaches will nurture community strengths.

- “includpreneurs” known as entrepreneurs who have lucratively realized inclusive business models, must be approached as partners to complement in-house functional capabilities with the aim of making inclusion initiatives more feasible and sustainable. Coastal communities should not be reluctant to engage with each other across the value chain.

Conclusion

In brief, given the importance of coastal resources to livelihoods, food security and climate resilience of the coastal communities, it is critical that coastal management initiatives do promote community-led innovation and behaviour change through outreach and wisely inform policy and decision making so that vulnerable coastal communities who bear the greatest brunt of climate change and coastal development, are not socially and economically excluded.

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