GREEN AND BLUE

Creating a Managed Environmental Network in the western Indian Ocean

Dennis Hardy, Uvicka Bristol, Eugenie Khani, Kelly Hoareau and Rowana Walton

James Michel Blue Economy Research Institute, University of Seychelles

Contents

List of Tables and Figures

Project Summary

This publication presents the outcomes of a research project undertaken in the *James Michel* Blue Economy Research Institute (BERI) at the University of Seychelles. It has been part-funded by the Indian Ocean Rim Association (IORA).

In response to an application submitted to IORA by Professor Dennis Hardy, an award was made in 2015 to enable the development of a managed network of environmental organisations in island states in the western Indian Ocean. The rationale for the project is simple – namely, that there are numerous organisations and individuals in the region with an interest in different aspects of the terrestrial and marine environment, but they are not always aware of each others work. It follows from this that there is potential to encourage a great sharing of knowledge and the means to enable such groups to benefit from the work of others and, where appropriate, to find ways to collaborate.

Four island states were selected for the project: Seychelles, Mauritius, Comoros and Madagascar. The IORA grant enabled us to appoint two young Seychellois graduates as research officers, in the first place to conduct a survey in each of these states. This was, in due course, followed by a seminar in Seychelles in September 2017, where commonalities and challenges could be discussed and, most pertinently, where the ground could be prepared for continuation of the network.

Some of the key results of the survey indicated that:

- Both Mauritius and Seychelles have a balanced focus on marine and terrestrial research, with a number of regional and international collaborators. Madagascar, in contrast, has fewer contacts outside the region and, other than fisheries, has interests in more terrestrial-based research. Comoros is also more focused on terrestrial research and has even fewer regional and international collaborators. In both Madagascar and Comoros, good research communication is hampered by poor internet facilities, while Mauritius and Seychelles are better served.
- For all four countries, a lack of funding for organisations was one of the most commonly encountered challenges. Alongside this, there were often not enough skilled personnel in the various countries to either undertake research or produce scientific publications; this

was particularly true for Comoros and Madagascar, where more advanced methods for communicating science were not well understood.

- The majority of participants agreed that they would share data on a regional server. Some reservations were stated in relation to intellectual property rights, competition for funding, confidentiality agreements and potential country-specific social and political influence.
- Although there are differences, there were a number of research areas that were similar across organisations and countries and would be suitable for further development under the network.
- Some strategies, seen as critical for the success of the network included; the creation of joint projects that would allow for the development of knowledge and skills across the network, a focus on complementary research themes to allow for mobility of researchers throughout the region, and the view that all countries in the region should be involved in the implementation of the network. Other considerations for the network are maintaining quality, accessibility, low costs, and member satisfaction.

In the course of undertaking the project, it soon became apparent that the need for a managed network is relevant not only between countries but even within each one. Various regional and international networks exist already, and these existing networks have been established for varying periods; in all such cases, there has been progress in connecting researchers and practitioners within their respective scope of interest. Starting with four neighbouring island states means that the managed network can focus on strengthening collaboration between these four countries to reach achievable outputs, rather than spreading the network too wide, too soon, and compromising the potential for specific benefits to these countries. It will enable development of research capacity through the focusing of financial and human resources and will allow us to share our strengths with each other.

The seminar conducted at the end of the project to discuss the challenges and way forward was recorded and a link for access to this was sent to all partners who were unable to attend the seminar. A web page was also created to; catalogue the project outputs, provide a point of communication, highlight funding grants on offer, and allow the network to expand partnership, funding opportunities and research/activity updates. There are some open-access tools that can be used to standardise how we publish and communicate our research and these have also

been highlighted on the website. BERI will commit to maintaining the network through the website, where necessary and possible.

Some ideas for future initiatives include:

- Securing one regional project to formalise collaboration between partner countries, to build on our strengths and work through some of the challenges identified during the survey.
- Seek funding to host an annual thematic research conference aimed at one specific research area to strengthen capacity. The aim would be to address partner development needs in a focused manner and to not dilute the conference with too many themes. The conference committee will be made of members from each partner country to encourage ownership of the network. The conference could be open to other international partners but, in terms of funding, priority will be given to partner countries to ensure we are well represented and to enable capacity development and further networking.

Acknowledgements

On behalf of the University of Seychelles, the authors of this report wish to express their gratitude to IORA for the opportunity to engage in what proved to be a fascinating study of four island states with clear differences but also much in common.

The project was based in the *James Michel* Blue Economy Research Institute at the University of Seychelles. IORA funding enabled the appointment of two research assistants, Uvicka Bristol and Eugenie Khani, both recent Seychellois graduates of the university's BSc programme in Environmental Science. As a learning exercise for the two, the project proved to be of inestimable value and both are now committed to pursue a Master's programme in this field. The project has served well in our efforts to build capacity in Seychelles and in the region.

Progress would not have been possible without the willingness to participate of numerous environmental organisations and individuals, and we wish to extend our thanks to all involved. Our intention is that the outcome, in the form of the establishment of a managed environmental network, will be of value to environmentalists across the region.

We are especially grateful to a number of particular organisations and individuals: Dr Gerard Rocamora for introducing the researchers to key individuals in Comoros; Mr Ibrahim Yahaya for assistance in hosting the research symposium at the Centre National de Documentation et de Recherche Scientifique (CNDRS) - Musée National des Comores; Cedric Rajoelina for his help in Madagascar; the Dean of the Faculty of Ocean Studies and others at the University of Mauritius; and all of our local partners, governmental organisations, NGOs and independent researchers in Seychelles for supporting the project.

Acronyms

BERI	*The James Michel* Blue Economy Research Institute
AFRC	Albion Fisheries Research Centre
CDST	Club des Sciences et Technique, University of Comoros
CI	Conservation International
CNDRS	Centre National de Documentation et de Recherche Scientifique-Musée National des Comores
CNRO	Centre National de Recherches Oceanographiques
EPCO	Environmental Protection and Conservation Organisation
GEF	Global Environment Facility
GIF	Green Islands Foundation
GVI	Global Vision International
IBC	Island Biodiversity and Conservation Centre
ICS	Island Conservation Society
IORA	Indian Ocean Rim Association
IPR	Intellectual Property Rights
JCI Moroni	Jeune Chambre Internationale Moroni
LBEPA	Laboratoire de Biologie-Ecologie Physiologie Animale, University of Comoros
LDC	Least Developed Countries
MCSS	Marine Conservation Society Seychelles
MEECC	Ministry of Environment Energy and Climate Change
MOU	Memorandum of Understanding
MWC	Madagascar Wildlife Conservation
MWF	Mauritian Wildlife Foundation
NGO	Non-Governmental Organisation
NHM-S	Natural History Museum - Seychelles
RNAP	Reseau National des Aires Protegees
SAA	Seychelles Agricultural Agency
SEC	Seychelles Energy Commission
SFA	Seychelles Fishing Authority
SIF	Seychelles Islands Foundation
SIDS	Small Island Developing States
SNPA	Seychelles National Park Authority
UNDP	United Nations Development Programme

UNESCO	United Nations Educational, Scientific and Cultural Organization
UniSey	University of Seychelles
UoM	University of Mauritius
WCS	Wildlife Conservation Society
WIO	Western Indian Ocean

1 INTRODUCTION

The project was located across a number of island nations in the western Indian Ocean: Comoros, Madagascar, Mauritius and Seychelles (see *Figure 1.1*). Although the study is localised, in different ways it exemplifies a much wider agenda of environmental research and practice. This includes issues of sustainability, the complexities of the Indian Ocean, and the particular challenges facing island states.

Figure 1 - Map showing the location of the four project countries (created using Google Earth)

1.1 Environmental Sustainability

'Governments, businesses and civil society together with the United Nations have started to mobilize efforts to achieve the Sustainable Development Agenda by 2030. Universal, inclusive

and indivisible, the Agenda calls for action by all countries to improve the lives of people everywhere'.[1]

The case for environmental sustainability is now a given. In the past half century, successive campaigns have made what has become the incontrovertible point that the world's environment can no longer be exploited in the way that had been common practice before, without thought for the future. Particularly in the face of rapidly growing demands, ways must be found to moderate use so that one generation will pass on nature's riches to the next. The accepted lesson is that we have to live within our means or, in the terminology that has now become standard, we must use environmental resources sustainably.

At first, the focus of environmental concern was on the land; not surprisingly, given that this is where the world's population lives and where most economic activity is centred. The extraction of minerals, housing development spreading ever wider, the cutting of rainforests, the spreading of chemicals across agricultural land: this kind of wanton use of the planet, it was argued, could not continue unchecked. Only more recently has the ocean attracted equal attention. Covering the greater part of the earth's surface, the ocean has been no less exploited but, out of sight, for many years it escaped close attention. No longer is this so. Devastating oil spills, over-fishing and loss of species, polluted beaches once popular with tourists, and the proliferation of plastic and other waste materials even in the furthest reaches of the ocean: the issues are no less pressing than those on land.

Land and ocean; green and blue. Activities that take place on land have a direct impact on the ocean. And it is together that they are now considered, high on the world's agenda. The demand for resources to support our growing needs and advances in technology have resulted in more pressure on valuable resources, both green and blue. Advances in technology and communication also now mean that we can join forces to address these challenges and impacts in a much more innovative and efficient manner. From being a marginal concept that had to be explained, sustainability is now an everyday word. A major landmark in its evolution was the publication in 2015 of the Sustainable Development Agenda of the United Nations. Through a set of seventeen goals, the ambitious agenda seeks no less that an end to poverty, protection

[1] United Nations 'Sustainable Development Goals: 17 goals to transform our world' n.d. http://www.un.org/sustainabledevelopment/. [Accessed 13 July 2017]

of the planet and prosperity for all, and all to be achieved by the year 2030. Targets are interlinked, but of the seventeen goals one is directed specifically to the land and one to the ocean. Whether these can all be achieved or not, the agenda offers encouragement to environmentalists everywhere, with the hope that, perhaps at last, the world means business.

1.2 The World's Third Ocean

'This is it,' said Safrial, a carpenter, to his two young sons when a towering tsunami of black water rushed toward them two years ago. 'This is the end of the world.'[2]

The Indian Ocean sets the scene for the present study of land and ocean, green and blue. Although the research spotlight is on just four island states, in the west of the region, the ocean as a whole and its peripheral development provides the essential backcloth. One part is connected to another, so no element can be fully understood in isolation. When the tsunami of 2004, emanating in Indonesia, swept westwards, the power of nature knew no boundaries. No less an environmental threat, the prospect of rising sea levels is similarly all-encompassing, with whole groups of low-lying islands like those of the Maldives, at risk of disappearing completely. These are dramatic examples but, at a more mundane level, the region is subject, day-by-day, to a range of environmental challenges that are no less pervasive in the long term.

Commonly referred to of as 'The Third Ocean', in deference to the larger expanses of the Pacific and Atlantic, the size and complexity of the Indian Ocean should not be under-estimated. With an area of some 70 million square kilometres it is more than four times the extent of Russia, itself by far the world's largest nation. It reaches from just beyond the Tropic of Cancer in the north to a latitude of 50 degrees or more south; from the warm waters of the Gulf of Oman and the Bay of Bengal to the icy temperatures of the Southern Ocean. The twenty-one countries that surround the ocean are located in the three continents of Africa, Asia and Australasia; to the south are the freezing wastes of Antarctica.

It has been traversed from all directions by early explorers, from China, Arabia and Europe, braving the unknown and dangerous seas to chart new trade routes for their various nations. It

[2] Seth Mydans, 'For Survivors of 2004 Tsunami, Recovery Is Slow', *New York Times*, 25 December 2006. http://www.nytimes.com/2006/12/25/world/asia/25cnd-tsunami.html?mcubz=0. [Accessed 13 July 2017].

continues to find itself at the crossroads of international traffic. Here, in the present day, are to be found some of the world's busiest shipping routes, including the container-based trade in manufactured goods from East Asia to Europe as well as the oil tankers that make their way from the Gulf States, through the narrow Strait of Hormuz and into the open sea beyond. As a geopolitical nexus it is criss-crossed with numerous lines of influence, alliances and conflict zones. While a majority of countries are at peace with themselves and their neighbours there are, too, some notable exceptions. Somalia, for instance, has become a by-word for a failed state, bearing the still-raw scars of centuries of rivalry between warlords, the colonial carve-up between Italy and Britain, and interference by the USA and the then Soviet Union during the Cold War. To add to these longstanding issues, Islamic factionalism has given rise to new rifts, and in the absence of effective government organised crime has created its own divisions. Even if it had wished to, the rest of the world could hardly ignore the plight of Somalia, given an episode of piracy that has had a serious impact on international shipping in the region. Yemen, too, is a war-torn country that has attracted the interest of foreign powers and is still far from finding a new equilibrium of peace.

1.3 Island States

'On such a full sea are we now afloat. And we must take the current when it serves, or lose our ventures.[3]

Brutus, in the quote above, was using the sea as a metaphor to urge that the time was right to take action. Today there is no need for a metaphor, for there is a literal imperative to 'take the current when it serves, or lose our ventures'.

Anyone who lives close to the ocean will be only too aware on a daily basis of the signs of encroachment. Beaches that once stretched far from the high-tide mark are now reduced to narrow strips, trees that formerly marked the coastline have toppled in the wake of advancing waters, and coastal roads are now regularly sprayed with sand and shingle as the ocean comes ever closer. For maritime communities, climate change is not an abstract theory, located somewhere in the future – it has already become an everyday reality. If, as the misguided King Canute discovered to his chagrin, it proves impossible to turn back the tide, we are left with the

[3] Brutus, in William Shakespeare, *Julius Caesar*, Act 4, Scene 3.

question of what else we can do. This is a question confronting each of the countries in our survey. To do nothing is no longer an option.

> *'Nor is this a question to be answered only by coastal nations. Rising above the oceans are thousands of small islands. Less obviously, there are large islands too. These include the great landmasses of Africa, the Americas, Europe/Asia, Australasia and Antarctica. It is hard think of the continents as islands but, surrounded by sea, that is what they are.*[4]

In this respect, we are all islanders. Yet, while acknowledging that there is a common interest and cause for concern amongst all nations, the fact is that islands in the generally accepted sense are especially on the frontline. Small islands, in particular, are the most vulnerable of all to issues like climate change and the threat of rising sea levels, as well as economic sustainability. Thus, most attention to date has been directed to small island states, notably in 2014 when the United Nations designated it as the year of Small Island Developing States (SIDS) and duly held an international conference in Samoa on the subject.

This project links four neighbouring countries located within the Indian Ocean, three of which are considered SIDS (Comoros, Mauritius and Seychelles) and one which is considered a Least Developed Country (LDC) (Madagascar). Each of these countries have their own political, economic and social frameworks which influence how research in the field of environment is undertaken. The purpose of this project was to highlight collaboration opportunities and possible challenges to enabling environmental research with the aim of initiating a managed network that can enable collaboration going forward.

[4] James Alix Michel (2016) *Towards the Blue Economy.* St Paul, Minnesota: Paragon House.

2 ASKING THE RIGHT QUESTIONS

The first step in developing the project was to endorse the aims of the approved application. Following the appointment of two research assistants, a survey was designed that would enable these aims to be met in the four different countries. As a starting point, it was essential to first identify the key stakeholders and to collect information on the status of their current research and the frameworks that support this (as far as possible). Once the data was collated, activities were initiated to start building this network.

2.1 Project Brief

The following submission was made to the Indian Ocean Rim Association (IORA):

> *'Application is made for support from the IORA Special Fund for a project that will assist in the formation of a managed network of environmental research (marine and terrestrial) – in Seychelles and with other member states across the western Indian Ocean.'*

The project was motivated by an understanding that countries in the region are facing comparable environmental challenges, on land as well as in the ocean. Climate change, in particular, poses many threats to these island states and the natural resources upon which they depend. The ocean that surrounds them has enormous economic potential – and even during the period of this project our understanding of the Blue Economy has grown – but its natural resources are greatly threatened by, for instance, indiscriminate waste disposal and over-fishing. Meanwhile, across the region the terrestrial environment is subject to an increasing pace of development, with the continuing loss of forests and farmland alike.

Various work is ongoing regionally, as seen from informal communications with peers and through various initiatives underway to address some of these challenges. In some countries, these efforts were more obvious than in others but it seemed that all shared common objectives. Experience showed, however, that there was remarkably little interaction between the various environmental groups and that valuable experience in one country (or even within the same country) was not necessarily being shared in another. The idea, then, of creating a managed network to facilitate a dialogue seemed a natural development of what one could already observe.

It was emphasised in the original application that there was never any question of usurping the interests of individual organisations nor of whole countries. Instead, it was all about 'value added'. As we said then about the proposed network:

> *'It is intended to be more than the sum of its parts; it will be a means to support and enhance the efforts of all of its researchers and of locating the western Indian Ocean on the international research map.'*

2.2 Survey Design and Implementation

Against this background, the research assistants first aimed to identify the participants for the survey who could participate in face-to-face interviews and also at a distance, in each of the four countries. An initial contact list, using consistent categories, was then developed with the aid of website addresses and through various partners in the region; additional contacts arose through personal contacts in the course of undertaking the research. A total of 49 participants were identified from four countries from a number of institutions – government agencies, non-government organisations, universities and independent researchers. A final list of participants is shown in Appendix 1.

The questionnaire itself used both qualitative and quantitative methods. An initial design was tested with potential participants, the outcome being a questionnaire with fifteen questions. Open-ended questions encouraged participants to provide additional information and enabled a dialogue with the surveyors, as did the group workshops organised in each country. This proved to be sufficiently robust and relevant for the purpose of the project when put to the test with a wide range of practice interviewees from different sectors in Seychelles prior to the survey being undertaken. A copy of the questionnaire is shown in Appendix 2.

As the researchers were already familiar with the participants in Seychelles, the opportunity was taken not only to conduct the questionnaire through face-to-face interviews but also to verify the suitability of the survey design. After the questionnaire was completed with the 21 participants in Seychelles, an additional four questions were included. A copy of the questionnaires used in Seychelles, and then the other three countries are shown in Appendix 2. In the less familiar environments of Comoros, Mauritius and Madagascar, participants were invited to an initial

briefing session where the nature and purpose of the survey could be explained. The questionnaires were completed by participants who participated in the sessions, and some were then sent electronically to additional participants identified during the country visits to ensure as many stakeholders could be captured as possible. Use of electronic surveys assisted with addressing financial and logistical constraints that limited the number of organisations that could be physically visited by the research assistants. In the end, however, the number of responses (physically and electronically) was limited by people's willingness to contribute to the project.

Participation and response rates varied between the four countries. Seychelles had the highest participation rate, although that was, at least in part, due to the researchers' familiarity with many of the participants and the ability to conduct face-to-face interviews (assisted by the ease of access to each organisation in terms of travel logistics when compared to other project countries). It was expected that the participation rate in Mauritius would be comparable to Seychelles but, in spite of notable exceptions such as the Faculty of Ocean Studies at the University of Mauritius, the response rates were fairly low. The number of organisations who attended the briefing session was limited and, of these, not everyone was willing to complete a questionnaire.

In contrast, in Comoros there was considerable enthusiasm for the project and a genuine willingness to participate. Individuals, who in many ways were quite isolated, appreciated the opportunity to be part of a regional network and were keen to participate. Unfortunately, due to poor infrastructure, the internet connectivity was unreliable and this reduced completion rates of the questionnaire. Madagascar also produced a positive response amongst those who were able to participate but here, too, a poor internet service reduced the response rate. The size of the country, which made it impractical for many to travel to Antananarivo to attend the briefing session, was also an important factor in the reduced rate of responses.

2.3 Country Variables

'An island is a fixed and finite piece of geography, and usually the whole place has been carved up and claimed.[5]

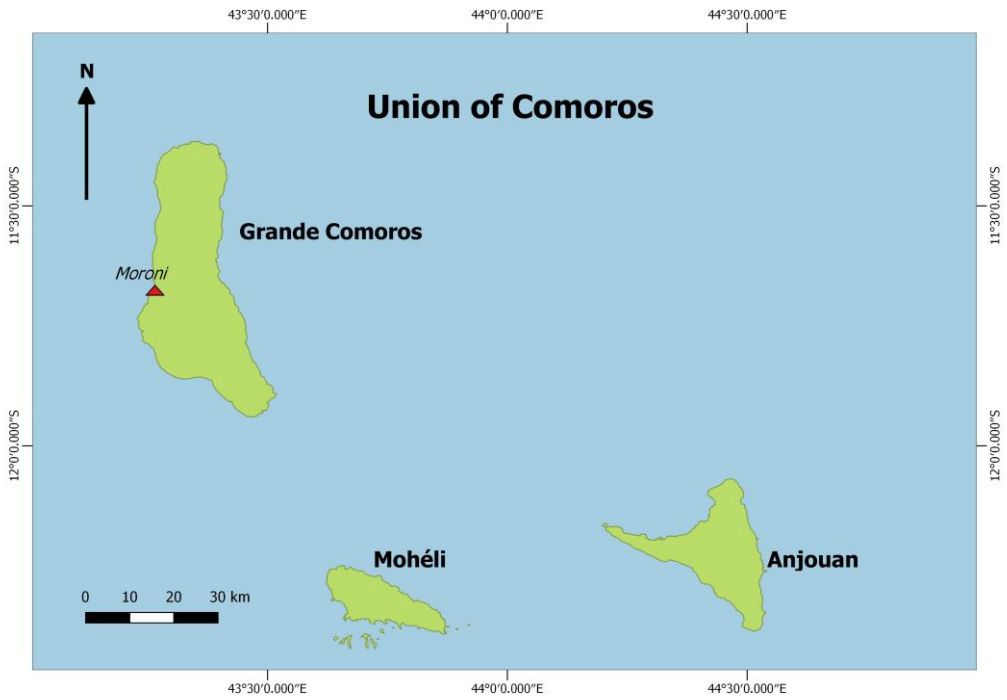
[5] Paul Theroux, American travel writer and novelist.

Each of the four countries presented different challenges and opportunities for the researchers and these may influence future research preparation planning and activities. Seven sets of criteria have been selected to reveal these respective differences, namely:

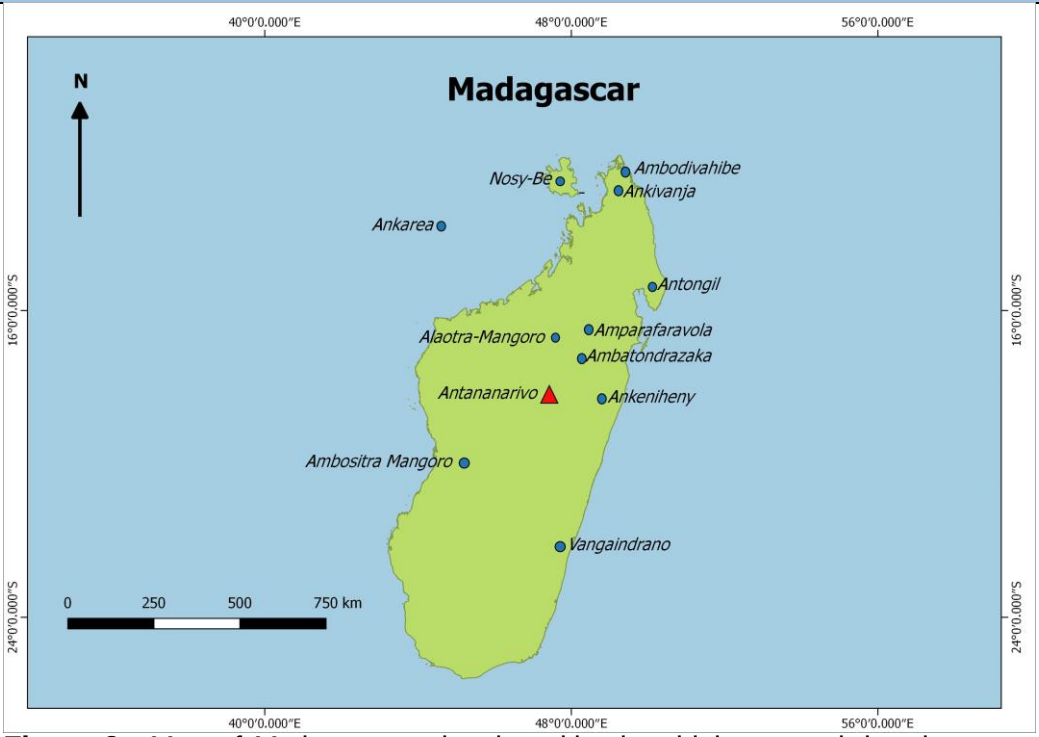
Environmental research focusing on terrestrial issues
Environmental research focusing on marine Issues
Political considerations
Religious considerations
Economic considerations
Primary language for interviews
Ease of physical access

These are summarised in the four tables in the sections below, with a separate map for each country to provide a visual context.

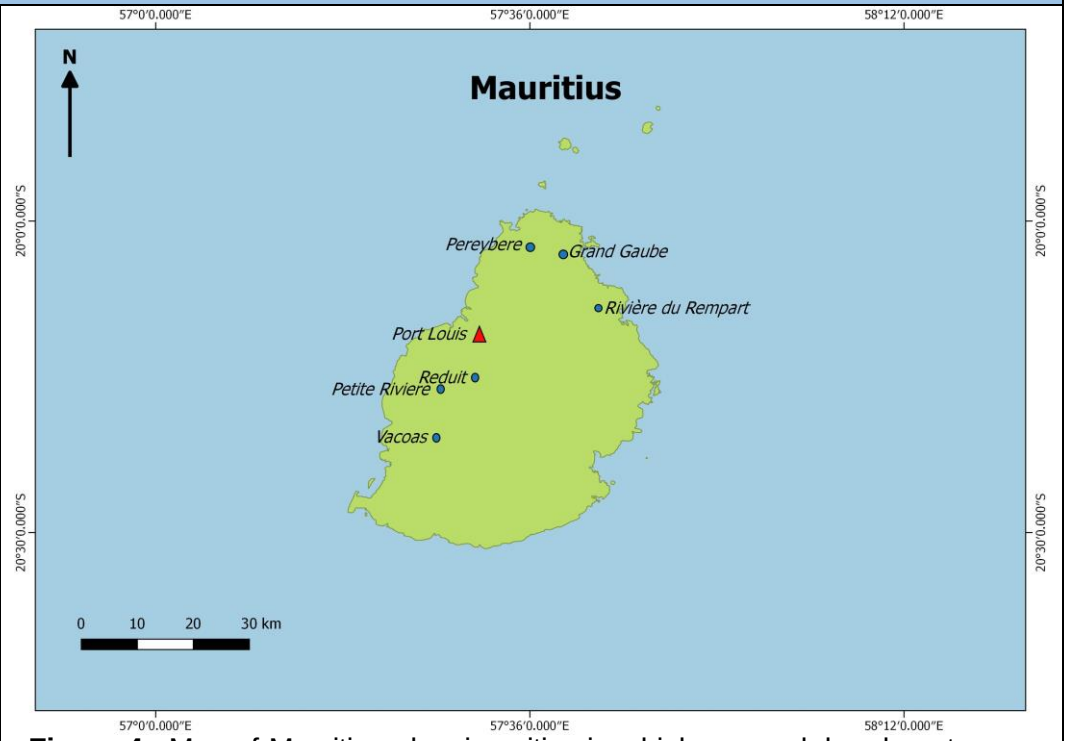
2.3.1 Comoros

COMOROS	
Map	 **Figure 2** - Map indicating three main islands of Comoros and the capital city Moroni (created using QGIS)
Table 1 – Information on seven criteria outlining the country of Comoros	
Country Size	1,862 km^2
Population Size	773,000
Primary Language	Arabic, French, Comorian (a blend of Swahili and Arabic)
Terrestrial Research	Terrestrial research includes forestry, botany and invasive species. The Katharla Volcano (an active volcano on Grande Comore) has a research unit exclusively studying the area for any activity. 20% of the terrestrial area is protected (Source: *Earthtrends,2003*).
Marine Research	The Comoros EEZ is an estimated 160,000 km² covering 427 km of coastline. A National Marine Park was established in 2001 by presidential decree. There is scientific research being conducted on mangroves, fish and mammals.
Political Considerations	The Comoros islands have a long history of political instability but is now more stable, though threats to this remain (Source: *World Bank, 2017*).
Religious Considerations	Islam is the main religion. There are no obvious religious considerations relating to environmental research (this excludes social studies), although an effort was made by the research assistants to respect Islamic customs in relation to clothing.
Economic considerations	The Comoros is one of the fifty least developed countries in the world according to the United Nations, and the last comprehensive survey showed that about 50% of Comorians live below the poverty line (Source*: Strategy for Accelerated Growth and Sustainable Development, 2015).*
Physical Access	The main island of Comoros is Grande Comoros (Ngazidja) with two other islands; Mohéli (Mwali) and Anjouan (Nzwani). The seminar and survey were carried out in Moroni,, Grande Comoros where the main headquarters for research organisations were located.

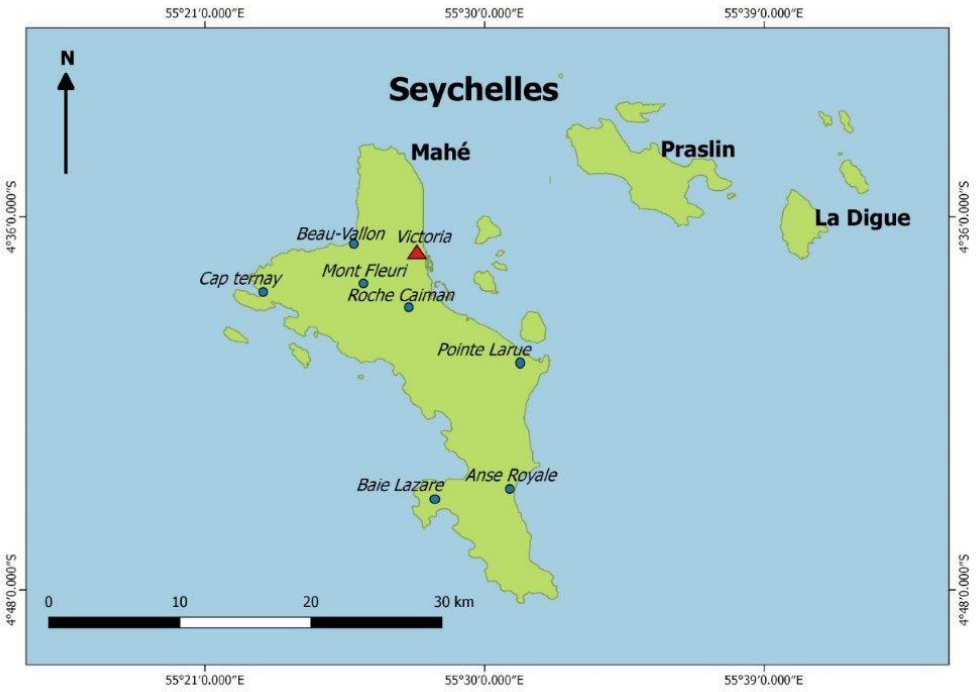
2.3.2 Madagascar

MADAGASCAR	
Map	 **Figure 3** - Map of Madagascar showing cities in which research headquarters are located of participant organisations (created using QGIS)
Table 2 - Information on seven criteria outlining the country of Madagascar	
Country Size	587,000 km^2
Population Size	24.24 million
Primary Language	Malagasy is the official language and French is also commonly spoken. The seminar and survey were conducted in French and English.
Terrestrial Research	Terrestrial research is focused on a wide range of fauna and flora, particularly lemurs which are unique to Madagascar. At least 10% of the Madagascar humid forests and 50% of the island's biodiversity are within protected areas which cover at least 2,320 square miles.
Marine Research	Madagascar has an EEZ of 1.2 million km² which is twice the area of the island. There are three community-led protected areas located along the west coast in the Mozambique Channel and 49 Marine Protected Areas (WCS, 2015). Scientific research is being conducted by local organisations as well as international organisations.
Political Considerations	Madagascar gained its independence from France in 1960. But, weak governance remains a key factor influencing Madagascar's development (Source: *World Bank, 2010*).
Religious Considerations	Indigenous beliefs and Christianity are the main religion in Madagascar (Source: *BBC, 2017*). There are no obvious religious considerations relating to environmental research (this excludes social studies).
Economic Considerations	Economic growth in Madagascar is estimated to have plateaued at 3.2% in 2015 but is projected to accelerate to 4.0% in 2016 and 4.5% in 2017 *(African Development Bank Group, 2017)*. It is still a very poor country with 76.5% of the population living under the poverty line (World Bank, 2010).
Physical Access	Transportation from one area to another is costly and time-consuming. The seminar was carried out in Antananarivo.

2.3.3 Mauritius

MAURITIUS	
Map	 **Figure 4 -** Map of Mauritius showing cities in which research headquarters are located of participant organisations (created using QGIS)
Table 3 - Information on seven criteria outlining the country of Mauritius	
Country Size	1,865 km^2
Population Size	1.2 million
Primary Language	English, French and Mauritian. The seminar was conducted in English.
Terrestrial Research	4.75% of land area has protected status and is managed by a number of environmental organisations for conservation and research. Deforestation, invasive species and loss of biodiversity are key issues (*World Bank, 2016*).
Marine Research	Mauritius has a total maritime zone of 2.3 million km². An EEZ of 1.96 million km² and a continental shelf of 396,000 km² co-managed with the Republic of Seychelles (*Board of Investment- Mauritius, 2017*) with 0.3% as Marine Protected Areas (*World Bank, 2014*). The government is committed to promoting the ocean economy as one of its main pillars of development.
Political Considerations	Mauritius has a multi-party system and has a framework of parliamentary democracy. The country's political situation has been stable since its independence in 1968 (*World Bank, 2016*).
Religious Considerations	There is no official religion in Mauritius but Hinduism is the most practised religion. Other dominant religious groups are Tamils, Muslims, Christians and Buddhists. There are no obvious religious considerations relating to environmental research (this excludes social studies).
Economic Considerations	Mauritius' economic growth was projected to increase to 3.8% in 2016. Economic growth is expected to cut poverty, but challenges associated with ongoing structural transformation will continue to pressure inequality (*World Bank, 2016).*
Physical Access	The seminar was held in Reduit at the University of Mauritius, but reference was also made to research on the outer islands.

2.3.4 Seychelles

SEYCHELLES	
Map	 **Figure 5** - Map of Seychelles showing cities in which research headquarters are located of participant organisations (created using QGIS)
Table 4 - **Information on seven criteria outlining the country of Seychelles**	
Country Size	176 km^2
Population Size	94,677
Primary Language	English, French and Creole are the official languages. English and some Creole used for interviews.
Terrestrial Research	Almost 50% of the land area is protected (*World Bank, 2016*). There is a good balance with marine research. Forests, invasive species and protection of biodiversity are key issues.
Marine Research	Seychelles has an EEZ of 1.4 million km², co-managed with Mauritius (*World Bank, 2015*).The Seychelles Marine Spatial Planning (MSP) Initiative will expand sustainable-use marine protected areas to conserve biodiversity across 15% of the EEZ (*United Nations, 2017*). Sustainability of fisheries and maintenance of a pristine environment for tourism are key issues. The Blue Economy concept is strongly supported.
Political Considerations	After years of one-party rule, open discussions are now the norm.
Religious Considerations	Catholicism is the dominant religion. There are no obvious religious considerations relating to environmental research (this excludes social studies).
Economic Considerations	The World bank's estimates of Gross National Income (GNI) per capita place Seychelles in the high income category. This means that access to overseas development aid is limited. There are still issues with available finance for research and capacity building.
Physical Access	Interviews were conducted on the main island, Mahé, but reference was also made to research on the outer islands.

3 OUTCOMES

The surveys were undertaken between February 2016 and February 2017, starting with Seychelles, which was most familiar to the researchers, and then Mauritius, Comoros and Madagascar. A summary of outcomes is presented below, with a more detailed presentation of findings in Appendix 3.

3.1 Collaboration

Given the aim of the project to create a managed environmental network, it was interesting to see the extent of present collaboration. For all countries the highest number of collaborations was either in-country, or within the western Indian Ocean region. Both Seychelles and Mauritius also had a number of regional and international collaborations. Madagascar, in contrast, had a smaller number of contacts outside the region and Comoros even fewer. It is promising that there is already a number of existing collaborations within the network, as this will be an excellent foundation on which to build the proposed regional research network. An immediate inference was that those with fewer contacts will benefit most from this managed network.

3.2 Research Themes

A similar grouping can be seen in relation to present research themes undertaken in each of the countries. Seychelles and Mauritius demonstrated a balance of interests, including both marine and terrestrial subjects. Madagascar had an interest in its extensive fisheries but most of its research is land-based, while Comoros predominantly looking towards the land rather than the ocean. One organisation in Comoros had a specialist interest in volcanic activity, reflecting the presence of that particular feature. The breadth and variety of research themes was impressive, although there were a number of areas that were similar across countries and would be suitable for further development under the proposed research network. On reflection it would have been pertinent to provide a list of research theme topics to the participants in the questionnaire, to allow for a more detailed comparison between countries and organisations as this was hampered by the range of answers given. A full list of research themes provided by participants is presented in Appendix 3.

3.3 Communication of Research

A number of methods (18 in total) was used in each of the four countries to communicate research results but in both Comoros and Madagascar good communication was hampered by a poor internet system and, as a result, most of the research is communicated in hard copy (such as brochures and booklets) or in person at workshops and conferences. Seychelles and Mauritius (where internet access is better) both make effective use of social media and other online methods (e.g. Research Gate, websites). Across all countries, similar challenges were encountered. A lack of funding was one of the most commonly encountered challenges. This funding was needed for equipment, publication of papers, attendance at conferences, and technical assistance. Alongside this, there were often not enough skilled personnel in-country to either undertake research or produce scientific publications. With a limited workforce across all countries there was often not time to either publish or communicate research findings. In Mauritius and Seychelles, participants also cited that there was a lack of platforms available to communicate research and that innovative ways to communicate research are not well understood, restricting communication to more traditional methods.

3.4 Facilitation of Research

Nearly all participants stated that they facilitate internships and partnerships in their respective organisations. These partnerships are invaluable and can help to address staffing shortages and extend their international networks; a few organisations in Mauritius were the only exception in this respect. There is considerable interest from overseas in the unique environments that each of the survey countries offers and often it is only a question of logistics and finances in arranging such visits that limits this facilitation.

Most countries still rely heavily on external consultants and scientists to facilitate research, with Mauritius and Seychelles including a higher number of their own staff, reflecting the progression in local capacity building that has been made in these countries.

3.5 Data Storage and Sharing

A variety of methods were used by the organisations and individuals across countries to store their respective data, although the trend is, understandably, towards electronic means. No data is available for Seychelles regarding this, as these questions were added after the questionnaires were completed. When asked if participants would be willing to share their data in an integrated network, the majority agreed that they would share data on a regional server.

Some reservations were stated in relation to intellectual property rights, competition for the same funding sources, confidentiality agreements and the different social and political contexts of each country.

3.6 Commonalities and Differences

'We have more differences than commonalities' was one pertinent response. Although there are, indeed, obvious differences, our researchers were no less impressed by what the various respondents shared. Clearly, there are geographical differences between the four countries, which account, say, for climatic variations and vegetation; equally, there are important contrasts in terms of economic development. There are also differences between the various organisations, some being wholly concerned with the ocean and others with the land. But there are also strong unifying factors, not least of all the impact of the encircling ocean and a commonality in global terms as they are all located in the western Indian Ocean.

3.7 Conflicts of Interest

When the researchers designed their questionnaire and engaged with the various respondents, they did so in the reasonable belief that there would be a common sense of agreement on the purpose of the project. All, it was assumed, would wish to see better communication between environmentalists in the region. In general, this was the case but it was also apparent that the various entities have conflicting interests and that these sometimes affected the responses given. Politics, for instance, would often play a part. Government agencies, for instance, would not necessarily wish all of their information to be shared, either within their own country or with other nations. NGOs, dependent on different sources of funding, would understandably be cautious about disclosing too much information. This kind of situation is by no means unique to environmental organisations and the researchers soon learned to identify what was not spoken as well as what was.

3.8 Indirect Benefits

Sometimes a research exercise will yield unexpected benefits, over and above those directly resulting from the formal process. This project proved to be no exception, with interesting outcomes in terms of: understanding the differences as well as similarities in the needs of the survey countries, recognising the different interests of the various research entities themselves,

forging valuable personal and organisational links, and noting the professional benefits of the process for the project's researchers.

For instance, even in an age when information can so easily be disseminated, one cannot underestimate the value of personal contacts. There were many instances of this, with respondents looking forward to maintaining active links with the researchers and parent organisations. Mention has already been made of the relative isolation of Comoros and this, perhaps not surprisingly, proved to be a source of particular interest in the project; individuals there are especially keen to be part of an active network in the future.

Another indirect benefit arose from the opportunity the project offered for professional training, in particular, through being able to appoint two young graduates. This was their first graduate assignment and both will agree that it was an invaluable learning experience. The work they undertook exposed them to the challenges of empirical research, to the uses of modern forms of communication, to essential social skills and to the *realpolitik* of environmental organisations. They have both matured in the process and now plan to enrol on postgraduate programmes. Enhancing capacity in this way is an outcome that is greatly appreciated by all parties and an exemplar of what can be done to assist island states.

4 DEVELOPING AND MAINTAINING A MANAGED NETWORK

4.1 Comparative Experience

The data received from the questionnaires was invaluable in understanding the requirements and needs of the participant countries in the development of a regional research network. The network is intended to promote cooperation across disciplines and between countries in the region, particularly amongst those who may be working in isolation.

There are a number of networks that are currently functioning within the region and worldwide that are focused on specific research areas of interest. Some of these include;

- WIOMSA (http://www.wiomsa.org/about-wiomsa/)
- Coral List (http://coral.aoml.noaa.gov/mailman/listinfo/coral-list)
- Western Indian Ocean Network on Invasive Species (http://www.wionet.net/)
- Various projects are coordinated by the Indian Ocean Commission (http://commissionoceanindien.org/activites/), e.g. the Management of marine biodiversity, coastal and island in the East Africa and Indian Ocean region
- Coral Reef Conservation Program (http://coralreef.noaa.gov/)
- Reef Resilience Network (http://www.reefresilience.org/)
- CORDIO (http://cordioea.net/)
- Pacific Invasive initiative (http://www.pacificinvasivesinitiative.org/)
- PERN – Population-Environment Research Network (https://populationenvironmentresearch.org/)

These networks can provide useful examples of how a network can operate successfully and create a space where ideas can be exchanged, new projects formulated and information and best practices shared. These networks use a variety of tools to connect their members. Three of these have been highlighted below.

1. The **Western Indian Ocean Marine Science Association** (WIOMSA) was established as a regional, non-profit, membership organisation in 1993. WIOMSA has built a diverse range of experience in coordinating research grant programmes, developing regional research agendas, organising capacity and professional development initiatives, linking science to management, environmental advocacy, networking and dissemination of

technical information. WIOMSA's core competencies also include project management and cross-boundary project facilitation and administration. To raise awareness and foster partnerships between its members WIOMSA publishes books, peer-reviewed papers, newsletters, magazines, fliers, brochures, DVDs, TV programmes, reports, journals, guides and manuals designed to serve the needs of a wide range of audiences. The WIOMSA website, and blog, and social media pages provide up-to-date news and announcements, while events such as the biennial WIOMSA Scientific Symposium brings together social and natural scientists, practitioners, non-governmental, government and intergovernmental agencies, funding agencies and decision makers to exchange ideas and realistically examine the current state of knowledge of coastal and marine resources and their management within the region.

2. The purpose of the **Coral-List** 'listserver' is to provide a forum for internet discussions and announcements pertaining to coral reef ecosystem research, conservation, and education. The list is primarily for use by coral reef ecosystem researchers, scientists and educators, but is of course open to everybody. As of May 2017 over 9,300 coral reef enthusiasts were subscribed to the list. The Coral-List 'listserver' is very simple and does not use any other method of communication aside from the emails received and sent to the membership list.

3. **Western Indian Ocean Network on Invasive Species** (WIONIS) is an information exchange network for anyone interested in any aspect of invasive species and their management in the western Indian Ocean region. The objective of WIONIS is to promote the effective prevention and management of biological invasions in the WIO region. WIONIS does this by facilitating the exchange of data, news, alerts, advice, requests and other information, by promoting collaboration, and by establishing links between those in need of a resource (e.g. information, expertise, technical assistance, training, funding, staff, volunteers) and those who can provide it. The network operates its own website as well as a 'listserver' and blog.

These existing networks have been established for varying amounts of time but all have made progress in connecting researchers and practitioners within their scope of interest. They provide

invaluable information on how an environmental research network can be developed and managed.

4.2 The Mechanics of a Managed Network

In the data collected from the questionnaires, the participants cited some strategies, which they thought would be critical for the success of the network. These included the creation of joint projects that would allow for the development of knowledge and skills across the network, a focus on complementary research themes to allow for mobility of researchers throughout the region, and the view that all countries in the region should be involved in the implementation of the network.

Building a network across such a large region, and across countries that are politically, culturally, geographically and economically different presents several challenges. Not all these countries can be treated the same and they do not all have the same infrastructure and capacity. Other considerations for the network are maintaining quality, accessibility, low costs, and member satisfaction. Starting with four neighbouring island states means that the network can focus on strengthening collaboration between these four countries to reach achievable outputs, rather than spreading the network too wide too soon and compromising the potential for specific benefits to project countries. It will enable development of research capacity through focusing financial and human resources and will allow us to share our strengths with each other. One of the greatest challenges stated by the participants was the sharing of data and data confidentiality. It is hoped that this network will allow for the fostering of regional partnerships where trust and confidence can be built to facilitate this data sharing process.

To create an active and functioning network these challenges need to be considered in the approaches and tools used, alongside lessons learned from other comparative networks.

4.3 Implementation and Monitoring

The project team and the information science team at the University of Seychelles have created a web page that will serve as the virtual meeting space for partners from the four countries. The website has been designed to: catalogue the project outputs; provide a point of communication; highlight funding grants on offer; and allow the network to expand partnership, funding opportunities and research/activity updates. There are some open access tools that can be used

to standardise how we publish and communicate our research and these have also been highlighted on the website. The web page is available in both English and French and can be found here: http://www.unisey.ac.sc/research-consultancy/blue-economy-research-institute/a-network-of-environmental-research-in-the-western-indian-ocean

A seminar was held at the end of the project to present the findings and website to the participants. The seminar was recorded and a link for access to this was sent to all partners who were unable to attend the seminar.

BERI will commit to maintain the network on a simple level, wherever possible. Some ideas to achieve this include:

- Securing one regional project to formalise collaboration between partner countries, to build on our strengths and work through some of the challenges identified during the survey.
- Seek funding to host annual thematic conferences between partner countries in specific thematic areas identified during the survey, we would like to aim to host one conference per year. We could have one theme to strengthen capacity in specific thematic areas or facilitate a few thematic areas, but the aim would be to address partner development needs in a focused manner and not to dilute the conference with too many themes. The conference venue can move between partner countries to build familiarity with partners and their countries and to facilitate ownership of the network between all project countries to ensure sustainability of the network The conference committee will be made of members from each partner country and it could be open to the region, but priority given in terms of funding to project countries to ensure we are well represented and that the network is strengthened.

5 APPENDICES

5.1 Appendix 1 – Copy of the IORA Questionnaire (English version)

Strengthening our Regional Environmental Research Network

Questionnaire Introduction

The Indian Ocean Rim Association (IORA) has awarded the University of Seychelles a grant to develop a stronger network of environmental research within the Western Indian Ocean (Seychelles, Mauritius, Comoros and Madagascar). The Blue Economy Research Institute will be the focal institution that will develop this project.

Subject to your agreement, the information compiled from the questions below will be shared with all contributors. In this way, we hope that stakeholders will be able to identify partners that will facilitate the development of collaborative local and regional projects.

Name of organisation:

Interview date:

Questions

1) Please indicate all physical locations of your organisation/institute
……
……
……
……

2) What is your position in the organisation/institute (e.g. CEO, Director, Manager, Vice Chancellor, Dean, Lecturer, Researcher)
……
……

3) Are you associated to or do you collaborate with individual or organisations doing research in any of the following countries:
a. Comoros
b. Madagascar
c. Mauritius
d. Seychelles
e. Other countries

(Please specify organisations and countries)
……
……
……

4) Within your organisation, what are the thematic areas of:
a. Previous research
……
……
……
b. Current research

……
……
……
c. Planned research
……
……
……

5) Do you have a research agenda?
a. Yes,
b. No
(Please specify)
……
……
……

6) Who undertakes your organisation's research?
a. Staff
b. Consultants
c. Visiting scientist
d. Other
(Please specify)
……
……
……
……

7) How is your research published?
a. Reports
b. Online news/publications
c. Journals
d. Articles
e. Other
(Please specify)
……
……
……
……

8) How do you communicate your research once published?
……
……
……

9) Do you have any challenges related to generating/publishing/communicating research?
……
……
……

10) Do you facilitate research internships or partnerships (e.g. for research fellows, local/international students, visiting scientists etc.)?
a. Yes,
b. No
(Please specify)
……
……

……
……

11) How does their work contribute to the research profile of your organisation? (Please specify)

……
……
……
……

12) In your view, what are the priority areas for research development and partnership?

……
……
……

13) Do you have any other views on what would make a regional research network successful or what could restrict the development of regional partnerships?

……
……
……

14) Do you have any other comments you'd like documented?

……
……
……

15) Please confirm your email address and contact details

……
……

I…… give permission for the above information to be compiled into a database that aims to strengthen future regional partnerships and collaboration opportunities and will be shared with contributing participants.

Signature:

Date:

5.2 Appendix 2 – Participants who completed the questionnaire in Comoros, Madagascar, Mauritius and Seychelles

	Comoros		
N0	**Governmental organisations**	**Location of work**	**Interviewee position**
1	*Centre National de Documentation et de Recherche Scientifique (CNDRS) - Musée National des Comores*	Moroni, Grande Comore	Researcher 1
2	*Centre National de Documentation et de Recherche Scientifique (CNDRS) - Musée National des Comores*	Moroni, Grande Comore	Researcher 2
3	*Centre National de Documentation et de Recherche Scientifique (CNDRS) - Musée National des Comores*	Moroni, Grande Comore	Researcher (Department of Anthropology)
4	*Centre National de Documentation et de Recherche Scientifique (CNDRS) - Musée National des Comores, Department Observatoire Volcanologique du Karthala*	Moroni, Grande Comore	Analyst of seismic data and micro-deformation
5	*Reseau National des Aires Protegees (RNAP)*	Moroni, Grande Comore	Marine Expert
N0	**NGOs**	**Location of work**	**Interviewee position**
6	*Assistance aux Initiatives Innovantes pour la protection de l'Environnement aux Comores (AIPEC)*	Moroni, Grande Comore, Anjouan and Moheli	Project Manager
7	*Association 2 Mains*	Moroni, Grande Comore, Anjouan and Moheli	Coordinator
8	*Jeune Chambre Internationale Moroni (JCI Moroni)*	Moroni, Grande Comore, Anjouan and Moheli	President
9	ULANGA	Moroni, Grande Comore	President
N0	**Universities**	**Location of work**	**Interviewee position**
10	*Club des Sciences et Technique (CDST), University of Comoros*	Moroni, Grande Comore	Centre President
11	*Laboratoire de Biologie-Ecologie physiologie Animale (LBEPA), University of Comoros*	Moroni, Grande Comore	Assistant Instructor
	Madagascar		
N0	**Governmental organisations**	**Location of work**	**Interviewee position**
1	*Centre National de Recherche Oceanographiques (CNRO)*	Nosy-Be, Antananarivo, Vangaindrano	Associate Researcher
2	*Centre National de Recherche Oceanographiques (CNRO)*	Nosy-Be, Antananarivo, Vangaindrano	Head of Department of Fisheries
N0	**NGOs**	**Location of work**	**Interviewee position**
3	*Conservation International (CI)*	D'Ambodivahibe, Corridor Ankeniheny Zahamena (CAZ), Ambositra Vondozo, Antananarivo	Coordinator
4	*Conservation International (CI)*	D'Ambodivahibe, Corridor Ankeniheny Zahamena (CAZ), Ambositra Vondozo, Antananarivo	Conservation Program Coordinator

5	*Madagascar Wildlife Conservation (MWC)*	Amparafavola, Ambatondraka, Alaotra-Mangoro	Project Coordinator
6	*Wildlife Conservation Society (WCS)*	Baie Antongil, Ankarea, Ankivonjy, Soariake	Marine Science Advisor
7	*Wildlife Conservation Society (WCS)*	Baie Antongil, Ankarea, Ankivonjy, Soariake	Research and Ecological Monitoring Coordinator
	Mauritius		
N0	**Governmental organisations**	**Location of work**	**Interviewee position**
1	*Albion Fisheries Research Centre (AFRC)**	Petite Riviere Mauritius	Director
N0	**NGOs**	**Location of work**	**Interviewee position**
2	*Environmental Protection and Conservation Organisation (EPCO)*	Grand Gaube, Mauritius	Vice President
3	*Mauritian Wildlife Foundation (MWF)*	Grannunu Road, Vacoas, Mauritius	Conservation Director
4	*Reef Conservation*	Pereybere, Mauritius	Managing Director
5	*Urban Cooling*	Port Louis, Mauritius	Administrative Engineer
N0	**Universities**	**Location of work**	**Interviewee position**
6	*Open University of Mauritius*	Reduit and Curepipe, Mauritius	Head, Library Services
7	*University of Mauritius, Faculty of Ocean Studies (UoM)*	Reduit, Mauritius	Dean
8	*University of Mauritius (UoM)*	Reduit, Mauritius	Academic Researcher-Associate Professor
9	*University of Mauritius, Faculty of Ocean Studies*	Reduit, Mauritius	Lecturer 1
10	*University of Mauritius, Faculty of Ocean Studies*	Reduit, Mauritius	Lecturer 2
11	*University of Mauritius (UoM)*	Reduit, Mauritius	Senior Lecturer
	*Ascent Up was indicated as the name of the organisation, but the email address was from AFRC; as Ascent Up does not seem to exist, we have used AFRC.		
	Seychelles		
N0	**Governmental organisations**	**Location of work**	**Interviewee position**
1	*Ministry of Environment, Energy and Climate Change (MEECC)*	Mont Fleuri, Mahe, Seychelles	Director Standards & Enforcement Section
2	*Natural History Museum-Seychelles (NHM)*	Victoria, Mahe, Seychelles	Assistant Museum Curator
3	*Seychelles National Park Authority (SNPA)*	Victoria, Mahe, Seychelles	CEO & Project Manager
3	*Seychelles Islands Foundation (SIF)*	Mont Fleuri, Mahe, Seychelles	Science & Project Coordinator
5	*Seychelles Fishing Authority (SFA)*	Victoria, Mahe, Seychelles	CEO & Senior Oceanographer
6	*Seychelles Energy Commission (SEC)*	Victoria, Mahe, Seychelles	Principle Officer for Energy Planning

7	*Seychelles Agricultural Agency (SAA)*	Victoria, Mahe Seychelles	CEO & Principle Research Officer
8	*United Nations Development Programme (UNDP)/ Global Environment Facility (GEF)/ Programme Coordination Unit (PCU)*	Victoria, Mahe Seychelles	Programme Coordinator
N0	**NGOs**	**Location of work**	**Interviewee position**
9	*Green Island Foundation (GIF)*	Victoria, Mahe, Seychelles	General Manager
10	*Global Vision International Seychelles (GVI)*	Cap Ternay, Mahe, Seychelles	Country Director
11	*Island Biodiversity & Conservation centre*	Anse Royale, Mahe, Seychelles	Chairperson
12	*Island Conservation Society (ICS)*	Pointe Larue, Mahe, Seychelles	Project & Science Manager
13	*Marine Conservation Society Seychelles (MCSS)*	Beau-Vallon, Mahe, Seychelles	Project Coordinator
14	*Mangroves For the Future (MFF)*	Victoria, Mahe Seychelles	National Coordinator
15	*Nature Seychelles*	Roche Caiman, Mahe, Seychelles	Chief Executive Officer
16	*Plant Conservation Action (PCA)*	Victoria, Mahe Seychelles	Active Member
17	*Sustainability for Seychelles (S4S)*	Mont Fleuri, Mahe, Seychelles	Project Manager
18	*Save Our Seas Foundation (SOSF)*	D'Arros, Seychelles	Program Director
N0	**Universities**	**Location of work**	**Interviewee position**
19	*James Michel Blue Economy Research Institute, University of Seychelles (UniSey)*	Anse Royale, Seychelles	Associate Professor
N0	**Independent researchers**	**Location of work**	**Interviewee position**
20	*Bruno Senterre*	Victoria, Mahe, Seychelles	Independent Researcher
21	*Christopher Kaiser-Bunbury*	Mont Fleuri, Mahe, Seychelles	Independent Researcher
22	*Gerard Rocamora*	Anse Royale, Mahe, Seychelles	Independent Researcher
23	*Victorin Laboudallon*	Praslin, Seychelles	Independent Researcher

5.3 Appendix 3 – **Thematic areas of research (previous, current and planned) for survey participants in Comoros, Madagascar, Mauritius and Seychelles**

Comoros			
Governmental organisation	**Previous research areas**	**Current research areas**	**Planned research areas**
1.Centre National de Documentation Recherche Scientifique – Musée National des Comores	• Water • Socioeconomic studies on water management	• Politics • Education • Culture	• Politics • Education
2. Centre National de Documentation Recherche Scientifique, Department Observatoire Volcanologique du Karthala	• Volcanic Risk and Environmental Impact	• Geological and structural risk management	• Structural analysis of the volcanic structure/building and modelling eruption mechanics
3.Reseau National des Aires Protegees	• Forestry • Botany • Marine environment and Mangroves	• Forestry • Botany • Marine Environment • Mangroves • Identification of animal and plant species (marine and terrestrial) • Development of CITES protocol	No response
NGOs	**Previous research areas**	**Current research areas**	**Planned research areas**
1.Association aux Initiatives Innovantes pour la protection de l'Environnement aux Comores	• Agroforestry and Botany • Green Entrepreneurship	• Agroforestry and Botany • Green Entrepreneurship	• Green Business and Waste Management
2.Association 2 Mains	No response	• Access to drinking water • Sustainable waste management • Sustainable agriculture	No response
3.Jeune Chambre Internationale Moroni	• Individuals and community • International Business	• Community • Environmental • Educational	• Social traits • Education • Recycle and re-use waste
4.ULANGA	• Environmental health • Climate change	• Environmental health • Climate change	No response
Universities	**Previous research areas**	**Current research areas**	**Planned research areas**
1.Club des Sciences et Technique, University of Comoros	• Study of species that are at the top of karthala from the island of the tortoise	No response	• Expand/introduce the club in Anjouan and Moheli in order to

			do more research on the other two islands
2.Laboratoire de Biologie-Ecologie physiologie, University of Comoros	• Protection of the environment • Elimination of hazardous species	• Protection of the local species by eliminating invasive species • Collection and identification of animal species	• Creation of research laboratories in the various faculties of the University of the Comoros
Madagascar			
Governmental organisation	**Past research areas**	**Present research areas**	**Future research areas**
1.Centre National de Recherche Oceanographiques	• FISHERIES: inventories, stock assessment, species biology, fisheries studies, socio-economics • BIOLOGY: penaeid shrimps, tunas, echinoderms, coral reefs physical and chemical physicalography • Health and Biodiversity • Agriculture, food security, and nutrition • Climate change	• Marine Biodiversity and Coastal biodiversity exploitation and valuation of marine resources • Management of marine environment and coastal heritage • Development of tools for oceanographic research innovation • Systematic monitoring of traditional fishing • Conservation of sharks and rays • Assessment of resources in the north-west zone and fishing activities of the crab • Environmental education	• A trial of juvenile production of sea cucumbers in a natural environment • Marine pollution • Acidification of the ocean and their impacts on marine resources • Comparative study and assessment of the impacts of climate change
NGOs	**Past NGOs research**	**Present NGOs research**	**Future NGOs research**
2a. Conservation International	• Conservation biology of endemic Malagasy rails: taxonomic resolution of Bemaraha wood rail *Canirallus* sp. • Training on ecological monitoring for field agents and local communities • Assess the status of high-elevation endemic amphibians and reptiles	• Land use planning for Corridor Ankeniheny Zahamena (CAZ) with Africa Biodiversity Collaborative	• Save critically endangered lemurs • Promotion of Fisheries and ecotourism – reinforce conservation management of MPAs • Sustainability community-based management of MPA • Developing sustainable livelihoods for communities involved in rainforests and MPAs
2b. Conservation International	• Rapid Assessment Program	• Coastal risk assessment • Ocean Health Index	• Economic valuation of marine ecosystem services

	• Climate Change Vulnerability Assessment		
3. Madagascar Wildlife Conservation	• Survey on the perception of *Hapalemur alaotrensis*	• Inventory of medicinal plants of Lake Alaotra	• The quality of habitat and the requirements of *Hapalemur alotrensis*
4a. Wildlife Conservation Society	• Terrestrial ecosystem: primate, flora, aquatic, carnivorous mammals, micromammals, reptiles-amphibians, bush-meat	• Primates	No response
4b. Wildlife Conservation Society	• Marine Mammals	• Marine Socio-ecological systems • Marine Mammals • Climate Change	No response
Mauritius			
Governmental organisation	**Past research areas**	**Present research areas**	**Future research areas**
1. Albion Fisheries Research Centre	• Quality Improvement	No response	• Water Quality, Security and Safety
NGOs		**Present research areas**	**Future research areas**
1. Environmental Protection and Conservation Organisation	Biodiversity of Flora and Fauna	Mari-culture	Alien Invasive Species
2. Mauritian Wildlife Foundation	• Terrestrial Biodiversity Conservation (Landbirds, Seabirds, Reptiles, tortoise, plants) • Conservation Education • Invasive Alien Species • Coral reef monitoring	• Bat Ecology and Human-Bat Conflict • Soil Erosion • Marine Debris • Food Web Studies • Conservation Management • Climate Change	• Bat Ecology and Human-Bat Conflict • Soil Erosion • Marine Debris • Food Web Studies • Conservation Management • Climate Change
3. Reef conservation	• Benthic mapping • Habitat mapping • Coral recruitment • Sedimentation • Seagrass monitoring and fish surveys	• Coral & seagrass monitoring • Coral bleaching and coral reef conservation • Habitat mapping	• Control of crown of thorns sea stars • Monitoring of natural threats to coral reefs and Bleaching • Further mapping of lagoon & coastal zone, spatial planning of conservation sites • Surveys of fish and coral
4. Urban cooling	No response	• Marine studies	No response

		• Chirp surveys • Wave modelling • Sea water properties and bathymetric survey at Bain Des Dames Port-Louis	
Universities	**Past research areas**	**Present research areas**	**Future research areas**
1. Open University of Mauritius	• Distance education	• Distance education	• Any topics on education
2. University of Mauritius, Faculty of Ocean Studies	• Water Resources • Urban planning	• Water Resources - Water Safety • Marine conservation and pollution studies • Sustainability of urban areas	• Ocean Acidification and Coral reef restoration • Sustainability issues in SIDS
3. University of Mauritius	• Coral reefs • Mangrove • Seagrass • Reef Fish • Plankton • Inter-Coastal Zone Management • Climate change	• Coral reefs • Mangrove • Seagrass • Reef fish • Plankton • Inter-Coastal Zone Management • Climate change • Malacology	• Coral reefs • Mangrove • Seagrass • Reef fish • Plankton • Inter-Coastal Zone Management • Climate change • Marine molluscs distribution around Mauritius and Genetic/Molecular characterisation of marine mollusc in the Republic of Mauritius
Seychelles			
Governmental organisation	**Past research areas**	**Present research areas**	**Future research areas**
1. Ministry of Environment, Energy and Climate Change	• Policies and Strategic Level, to identify gaps	No response	• Marine ecosystem • Migratory species • Invasive species
2. Natural History Museum-Seychelles	• Caecilian and Herbarium plant	No response	• Insects continuation of coral research and herbarium
3. Seychelles Agricultural Agency	• Greenhouse Technology • Irrigation • Hydroponics • Pest Management	• Flood • Disaster and risk Management • Soil Fertility • Disease Management	• Research that promotes the livelihood of farmers

		• Soil Salinity • Agroforestry	
4. Seychelles National Park Authority	• Climate Change Resilience • Benthic mapping • Plankton monitoring • Mangrove Restoration • Coastal Rehabilitation • Socio-economic • Ecotourism • Biodiversity and ecology	• Coral Reef Ecosystem • Coastal Ecosystem • Mangrove Ecosystem • Shark Tagging • Benthic Mapping • Climate Change Resilience • Socio-economic	• Blue Carbon • Ecosystem based adaptation • Ecosystem Resilience • Management of Protected Areas (socio-economic benefits) • Priority species such as the Seychelles Paradise Fly-Catcher, Scops owl (Species age, population status and risk)
5. Seychelles Islands Foundation	• Giant tortoise • Sea turtle monitoring • Landbirds and seabirds	• Invasive alien species	• Evidence based conservation research • Ecosystem-based Research and Indicator Species as a proxy for Ecosystem Health
6. Seychelles Fishing Authority	• Fisheries • Oceanography • Aquaculture	• Fisheries • Oceanography • Aquaculture	• Fisheries • Oceanography • Aquaculture • Ecology and genetics
7. Seychelles Energy Commission	• Renewable Energy • Energy Efficiency and Energy Planning	• Pricing of Renewable Electricity, Feeding of Tariff and Grid Code	• Large forms of Photovoltaics (PV) on Ile de Romain Ville, Solar Photovoltaics (PV) in the lagoon before Providence Highway and Electricity from Waste (landfill Providence)
8. United Nations Development Programme, Global Environment Facility and Programme Coordination Unit	• Climate Change and Resilience	• No response	• Water Issues • Disasters and Risks Management
NGOs	**Past research areas**	**Present research areas**	**Future research areas**
1.Green Islands Foundation	• Invasive Species • Coastal Zone Management Fisheries and Marine Research	• Fisheries and Marine Research	N/A
2.Global Vision International	• Coral Reef Monitoring • Plankton Collection	• Coral Reef • Coco de Mer Growth Surveys	• Lemon shark acoustic telemetry • Mangrove & Bird Monitoring

		• Beach Profiling • Turtle • Giant Tortoise census • Mangrove & Bird Monitoring • Lemon shark tagging Environmental Education	• Lemon shark tagging Environmental Education
3.Island Conservation Society	• Turtles • Seabird Ecology and Conservation • Restoration of island ecosystems • Coral Reefs	• Turtles • Seabird Ecology and Conservation • Restoration of island ecosystems • Coral Reefs	• Turtles • Seabird Ecology and Conservation • Restoration of island ecosystems • Coral Reefs
4.Mangrove For the Future	• Coastal Zone Management	• Resilient Assessment Programme	• Coastal Zone Management, Resilient Assessment Programme
5.Marine Conservation Society Seychelles	• Marine mammal diversity and distribution • Whale Shark ecology • Fisheries	• Turtle nesting activity • Coral rehabilitation • Protected area creation • Wetland management • Terrapin population studies	• Depredation of marine mammal research • Coral nurseries • Rehabilitation of reefs • Protected areas
6.Nature Seychelles	• Environmental Economics • Island ecosystems • Restoration ecology • Climate change	• Species restoration • Climate change • Blue carbon	• Ecosystem services
7.Save Our Seas Foundation	• Tropical & marine conservation	• Tropical & marine conservation	• Tropical & marine conservation
8.Sustainability for Seychelles	• Sustainable development	• Sustainable development	• Sustainable development
Independent researchers	**Past research areas**	**Present research areas**	**Future research areas**
1. Chris Kaiser-Bunbury	• Ecology • Invasive Species • Biodiversity	• Ecology Restoration	• Ecosystems • Climate change • Invasive Species
2. Gerard Rocamora	• Invasive Alien Species	• Invertebrate Ecology	• Biodiversity
3. Victorin Laboudallon	• Ridge to Reef	• Forest fires	• Land degradation • Forest fires • Restoration
4. Bruno Senterre	• Restoration • Ecology	• Restoration • Flora	• No future research planned

	• Biodiversity • Flora taxonomy		
Universities	**Past research areas**	**Present research areas**	**Future research areas**
1.James Michel Blue Economy Research Institute, UniSey	• Mangrove restoration • Community perceptions of climate change vulnerability, • Power to Gas renewable energy technologies • Sandy beach ecosystem resilience to sea level rise • UAV mapping of coastal ecosystems.	• Mapping of coastal vulnerability to climate change • Mangrove restoration, aquaponics • Community perceptions of climate change vulnerability • UAV mapping of coastal habitats.	• Mapping of coastal vulnerability to climate change • mangrove restoration, aquaponics • Community perceptions of climate change vulnerability • UAV mapping of coastal habitats.

5.4 Appendix 4 – **Organisations using a research agenda as defined by survey participants in Comoros, Madagascar, Mauritius and Seychelles**

Countries	**No of Respondents**	**No of organisations using a research agenda**
Comoros	7	5
Madagascar	4	4
Mauritius	6	5
Seychelles	19	10

5.5 Appendix 5 – **Details of research agendas as defined by survey participants in Comoros, Madagascar, Mauritius and Seychelles**

Organisation	Agenda Y/N	Focal areas
Comoros		
Association 2 Mains	N	N/A
Centre National de Documentation et de Recherche Scientifique - Musée National des Comores	Y	Political, educational and social themes
Centre National de Documentation et de Recherche Scientifique - Musée National des Comores, Department Observatoire Volcanologique du Karthala)	Y	Their research focuses on the further development of past, present and future research
Club des Sciences et Technique, University of Comoros, University of Comoros	Y	Their main area of research is decided on a day to day basis
Jeune Chambre Internationale Moroni	Y	Observations and prediction of geological alcas/algae in the Comoros
Reseau National des Aires Protegees	Y	Issues concerning terrestrial and marine species in Comoros
ULANGA	N/A	N/A
Madagascar		
Centre National de Recherches Oceanographiques	Y	Integrated Coastal Zone Management, Coastal Governance, and Evolution of ecosystems in the face of climate change (integration of satellite oceanographic data - to start). Systematic monitoring of traditional fishing in the bay of Ambaro, Ampasindava and in the bay of Narindra, Monitoring and conservation of Madagascar sharks, skates and fish, Assessment of resources in the north-west zone and fisheries activities on crab - Scylla Serrata
Conservation International	Y	N/A
Madagascar Wildlife Conservation	Y	The quality of habitat and the requirements of *Hapalemur alaotrensis*
Wildlife Conservation Society	Y	N/A
Mauritius		
Albion Fisheries Research Centre	Y	Does not exclusively drive the activities of the Centre
Environmental Protection and Conservation Organisation	N	N/A

Mauritian Wildlife Foundation	Y	Terrestrial biodiversity
Reef Conservation	Y	All research falls under conservation projects for lagoon ecosystems - voluntary marine conservation areas
Urban Cooling	Y	Would like to conduct a survey where the properties of seawater are analysed, e.g. water composition, temperature, seabed profile
University of Mauritius, Faculty of Ocean Studies	Y	N/A
Seychelles		
Global Vision International	Y	No further response
Green Island Foundation	Y	No further response
Island Biodiversity & Conservation centre	Y	No further response
Island Conservation Society	N/A	No formal research agenda
James Michel Blue Economy Research Institute, UniSey	Y	Up until 2017 BERI's duties have entailed the developed of National research priorities, the development of local and international research collaborations and partnerships, the development of a Master of Science Programme in Marine Science and Climate Change, applying for grants funding and the employment of five new research staff.
Mangroves For the Future	N	Funding agency dictated by funding projects
Marine Conservation Society Seychelles	N	N/A
Ministry of Environment, Energy and Climate Change	N	Do not implement research, other organisations are mandated to undertake research that they need e.g. SNPA is one organisation that conducts research for them
National History Museum Seychelles	N	N/A
Nature Seychelles	Y	No further response
Plant Action Conservation	N	No further response
Save Our Seas Foundation	Y	Research is guided by mission and objectives of Foundation
Seychelles Agricultural Agency	Y	At the beginning of the year, a research agenda is developed (some are new and some are continued), but the research agenda is retained within the organisation

Seychelles Energy Commission	Y	Has a work plan on an annual basis
Seychelles Fishing Authority	Y	Based on the fishery industry needs and management plan
Seychelles Islands Foundation	N	Use annual work plans that are based on management plans and the ecological values of the sites
Seychelles National Parks Authority	N	Developing a research strategy based on SSDS and nation plan
Sustainability for Seychelles	Y	It is part of the S4S mission to leave a timely agenda, however cannot do so due to lack of Human Resources
United Nations Development Programme, Global Environment Facility, Programme Coordination Unit	N	Tailor research to answer specific concerns

5.6 Appendix 6 – **Research facilitators as defined by survey participants in Comoros, Madagascar, Mauritius and Seychelles**

Country	Research facilitators
Comoros	• Consultants (10) • Research institutes (4) • Staff (1) • Visiting scientist (1)
Madagascar	• Associate Researcher (2) • Interns (1) • PhD Students (2) • Visiting scientist (1) • Staff (4) • Consultants (2) • NGOs (1) • Partners (2) • Other Organisations (1)
Mauritius	• Consultants (4) • Experts contracted for specific studies (1) • PhD/Masters students (1) • Professional researchers (1) • Qualified marine scientist (1) • Staff (11) • Students (2) • Visiting scientist (2)
Seychelles	• Consultants (15) • International organisations (1) • Local organisations (1) • Members (4) • Overseas/Intern students (4) • Project grantees (1) • Staff (18) • Visiting scientist (18) • Volunteers (4)

5.7 Appendix 7 – Communication methods used to disseminate research results by survey participants

Country	Communication method	Country	Communication method
Comoros	• Articles (1) • Booklets (2) • Conferences (2) • Journals (1) • Meetings (3) • Online/Internet (3) • Reports (1) • Website Archive (1) • Workshop (2)	*Mauritius*	• Conferences (1) • Emails (1) • Journals (1) • Linked-In (1) • Newsletters (1) • Newspapers (1) • Online/Website (4) • Research Gate (1) • Social Media (2) • Workshop (1) • Library (1)
Madagascar	• Conferences (4) • Booklet (2) • Media (1) • Brochure (1) • Meetings (1)	*Seychelles*	• Articles (2) • Educational Material (2) • Email (7) • Exhibition (1) • Journal (2) • Media (5) • Newsletter/publications (1) • Newspaper (1) • Online (2) • Open Field Day (1) • Popular articles (1) • Reports (3) • Social Media (7) • Social media teams (1) • Soon on the organisations website (1) • Website (8) • Workshop presentations/Research Symposium (8) • Seminars (1)

5.8 Appendix 8 – **Areas for research development and partnerships as defined by survey participants in Comoros, Madagascar, Mauritius and Seychelles**

Comoros • Business • Conservation of biodiversity • Green economy and entrepreneurship • Thematic buyers
Madagascar • Biological Assessment • Climate change and other environmental pressures- All areas are priorities for the development of research and partnership • Collaboration with donors to fund priority research • Development of a common (regional) exchange research program • Drinking water, the satisfaction of food needs, the sustainability of resources in adapting to climate change • Identification of the paternity countries where the research would be carried out and the knowledge of the field of study and the target area of the partners • Socio-ecological systems, Climate Change
Mauritius • Alien invasive species management • Aquaculture • Blue/ocean economy • Climate change • Coastal and ocean management • Coral reefs • Deep sea organisms and ecology • Disaster risk reduction • Ecosystem services evaluation • Energy efficiency • Food security • Invasive species and diseases • Marine and environment restoration • Marine mollusc • Marine spatial planning

- Marine surveys to identify new species deep in our ocean
- Mauritius
- Natural resources economics
- Ocean resources
- Restoration ecology
- Socio-ecological projects for conservation spatial planning for marine protected areas
- Sustainable urbanisation
- Urban planning; biodiversity
- Waste management
- Water resources
- Water resources management

Seychelles

- Biosecurity
- Causes of Algae blooms
- Climate change/ Impacts of climate change on coastal systems
- Conservation and restoration of endangered species
- Coral reef ecosystems
- Ecosystem-based research
- Flora of Seychelles
- Focus on marine areas to fill knowledge gaps where information on marine species is limited
- Group stakeholders working on marine research together
- Improve technologies e.g., greenhouse mechanisation (agriculture)
- Invasive species/Understanding the impacts of invasive alien species (IAS) on invertebrates and other plants
- Key biodiversity areas and management of forests (sustainable forest management)
- Marine and terrestrial monitoring
- Marine Research
- Risk assessment of all IAS
- Small islands sustainability
- Sustainable development
- The impact on highly exploited fish species e.g. Red snapper
- The interconnectivity between ecosystem functionality that enables overall ecosystem resilience to be maintained i.e. how different ecosystems work together to maintain their overall health, ecosystems services and resilience to disturbance.

- Tropical and marine conservation, MPAs
- Vulnerable and endemic species
- Waste management

5.9 Appendix 9 – **Data storage formats used in all Comoros, Madagascar, Mauritius and Seychelles as defined by survey participants in Comoros, Madagascar, Mauritius and Seychelles**

	Data storage format	
Country	**Paper**	**Digital**
Comoros	• Booklets (1)	• Databases (1) • Hard-drives (1) • Computer (4) • Servers (1) • USBs (1) • Website-archives (1)
Madagascar	• Log sheets (1) • Library e.g. printed copies (1)	• Online (1) • Data-Sharing Network e.g. REBIOMA (1) • Computers (2)
Mauritius	• Datasheets (1) • Field notebooks (1)	• E-format (1) • Cloud storage (1) • Online backup (1) • Databases (1)
Seychelles	• Project file storage cabinet	• File storage space/server • Hard-drives