

# Western Indian Ocean JOURNAL OF Marine Science

Volume 20 | Issue 1 | Jan – Jun 2021 | ISSN: 0856-860X



# Western Indian Ocean JOURNAL OF Marine Science

Chief Editor **José Paula** | Faculty of Sciences of University of Lisbon, Portugal

Copy Editor **Timothy Andrew**

---

## Editorial Board

**Serge ANDREFOUËT**

France

**Ranjeet BHAGOOLI**

Mauritius

**Salomão BANDEIRA**

Mozambique

**Betsy Anne BEYMER-FARRIS**

USA/Norway

**Jared BOSIRE**

Kenya

**Atanásio BRITO**

Mozambique

**Louis CELLIERS**

South Africa

**Pascale CHABANET**

France

**Lena GIPPERTH**

Sweden

**Johan GROENEVELD**

South Africa

**Issufo HALO**

South Africa/Mozambique

**Christina HICKS**

Australia/UK

**Johnson KITHEKA**

Kenya

**Kassim KULINDWA**

Tanzania

**Thierry LAVITRA**

Madagascar

**Blandina LUGENDO**

Tanzania

**Joseph MAINA**

Australia

**Aviti MMOCHI**

Tanzania

**Cosmas MUNGA**

Kenya

**Nyawira MUTHIGA**

Kenya

**Ronel NEL**

South Africa

**Brent NEWMAN**

South Africa

**Jan ROBINSON**

Seycheles

**Sérgio ROSENDO**

Portugal

**Melita SAMOILYS**

Kenya

**Max TROELL**

Sweden

---

## Published biannually

**Aims and scope:** The *Western Indian Ocean Journal of Marine Science* provides an avenue for the wide dissemination of high quality research generated in the Western Indian Ocean (WIO) region, in particular on the sustainable use of coastal and marine resources. This is central to the goal of supporting and promoting sustainable coastal development in the region, as well as contributing to the global base of marine science. The journal publishes original research articles dealing with all aspects of marine science and coastal management. Topics include, but are not limited to: theoretical studies, oceanography, marine biology and ecology, fisheries, recovery and restoration processes, legal and institutional frameworks, and interactions/relationships between humans and the coastal and marine environment. In addition, *Western Indian Ocean Journal of Marine Science* features state-of-the-art review articles and short communications. The journal will, from time to time, consist of special issues on major events or important thematic issues. Submitted articles are subjected to standard peer-review prior to publication.

Manuscript submissions should be preferably made via the African Journals Online (AJOL) submission platform (<http://www.ajol.info/index.php/wiojms/about/submissions>). Any queries and further editorial correspondence should be sent by e-mail to the Chief Editor, [wiojms@fc.ul.pt](mailto:wiojms@fc.ul.pt). Details concerning the preparation and submission of articles can be found in each issue and at <http://www.wiomsa.org/wio-journal-of-marine-science/> and AJOL site.

**Disclaimer:** Statements in the Journal reflect the views of the authors, and not necessarily those of WIOMSA, the editors or publisher.

Copyright © 2021 – Western Indian Ocean Marine Science Association (WIOMSA)

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means without permission in writing from the copyright holder.

ISSN 0856-860X



# Local people and mangroves: Ecosystem perception and valuation on the south west coast of Mauritius

Shafiq Abib<sup>1\*</sup>, Chandani Appadoo<sup>1</sup>

<sup>1</sup> Department of Biosciences and Ocean Studies, Faculty of Science, University of Mauritius, Réduit, Mauritius.

\* Corresponding author: shafiq88@gmail.com

## Abstract

Mangrove ecosystem services are multi-dimensional (ecological, socio-cultural and economic), and their valuation is complex as not all of these dimensions are quantifiable in terms of monetary value. The main goal of this study was to determine the perception of local residents on the economic values of the mangrove ecosystem along the south west coast of Mauritius (Savanne and Black River Districts). A survey questionnaire (Savanne district, N=142; Black River district, N=126) was designed electronically in English and Mauritian Creole language using dichotomous, multiple choices and closed ended questions. The mean value for the awareness score was 52.3 and the standard deviation was 4.8 for the district of Savanne as compared to Black River district, where the mean value was 53.8 and the standard deviation was 9.0. The mangrove products harvested by locals from the surveyed sites were fish, crabs and oysters. The respondents were less willing to contribute to mangrove conservation activities both in terms of money (Savanne district, 4.2 %; Black River district, 3.9 %), and time (Savanne district, 7 %; Black River district, 4 %). Hence, campaigns and education programmes are critical to raise the awareness and concern of local residents to achieve Sustainable Development Goal (SDG) 14 in Small Island Developing States (SIDS) like Mauritius.

**Keywords:** ecosystem services, Mauritian Creole, survey questionnaire, awareness score

## Introduction

The worldwide distribution of mangrove forests coincides with the 20 °C summer isothermal line (Duke *et al.*, 1992). The global coverage of mangroves is estimated to be between 13,800 ha (Giri *et al.*, 2011) to 15,300 ha (Spalding, 2010). Approximately two thirds of the total coverage of mangroves in the world is located mostly in eighteen countries - Indonesia, Brazil, Australia, Mexico, Nigeria, Malaysia, Myanmar, Bangladesh, Cuba, India, Papua New Guinea, Colombia, Guinea Bissau, Mozambique, Madagascar, the Philippines, Thailand and Vietnam (Giri *et al.*, 2011).

On the African continent, mangrove cover represents approximately 20 % of the world's mangroves (Giri *et al.*, 2011). The greatest mangrove cover occurs in Nigeria and Mozambique (Fatoyinbo and Simard, 2013). In the Western Indian Ocean (WIO), mangroves occur

along the coasts of Madagascar, Mauritius, Seychelles, Kenya, Tanzania, north and central Mozambique and South Africa. The South African mangroves at the Mgazana estuary mark the southern limit for mangroves in Africa.

In Mauritius, mangroves are found in estuarine conditions providing shelter to the coastline. The narrow belt of mangroves is found mostly in the regions of Poste la Fayette, Roches Noires, Trou d'Eau Douce, Poste de Flacq, Vieux Grand Port and Black River. However, other major areas of mangroves are found along the shores of small islets such as Ile aux Cerfs and Ile D'Ambre which also form part of the Republic of Mauritius. Some other small patches are found in the south and south-west regions, namely in Maconde and Tamarin (FAO, 2005). *Rhizophora mucronata* and *Bruguiera gymnorrhiza* are the only species of mangrove found in Mauritius.

Within the last three decades deforestation and degradation of mangrove ecosystems has become widespread all around the world (Alongi, 2002). Unfortunately, in the same period, 30 % of mangrove forest area in Mauritius has undergone exploitation or alteration through 1) clearing for settlement, 2) infrastructural development, 3) provision for boat passages, 4) firewood, and 5) vandalism (Gopala, 1980). Consequently, policy makers have reacted by promulgating the first Fisheries and Marine Resources Act of 1998, which was later amended in 2007. The Fisheries and Marine Resources Act of 2007 stipulates that 'No person shall, except with the written approval of the permanent secretary, cut, take, remove or damage a mangrove plant'. In order to restore the mangrove ecosystem, the Government of Mauritius in collaboration with non-governmental organizations initiated several mangrove restoration programmes (Gopala, 1980). A total of 50,000 mangrove seedlings were planted at Le Morne, and 10,000 at Quatre Soeurs and Case Noyale. As a result, this has boosted the declining mangrove area from 45 ha in the year 1980 to 145 ha in 2013 (Bosire *et al.*, 2016).

The major role of mangrove trees lies in the provisioning of socioeconomic benefits, such as timber, fish, tourism opportunities, and environmental services (Sarhan *et al.*, 2018). In addition to providing forest dependent livelihoods, mangrove forests greatly influence the local and national economy (Udhin *et al.*, 2013). Several studies have attempted to quantify the economic value of mangrove ecosystems. The study conducted by Costanza and Folke (1997) estimated the average value of mangrove ecosystem services worldwide to be USD9,990 per hectare per year which is well above tropical forests, estimated to be USD2,007 per hectare per year (Chow, 2015). In contrast to quantitative economic valuation, mangroves exhibit a social value, which is critical for the proper functioning of society and human well-being (Chiesura and de Groot, 2003). Such social value is understood to be the source of well-being and is closely related to historical, communal, ethical, religious and spiritual values (James *et al.*, 2013).

Within the context of the current study, social value is based on the view of local residents of mangroves for their value and the perceived tangible and non-tangible benefits which are provided by the mangrove forests in the south-west coast region of Mauritius. Until now, no studies on the social valuation of mangroves have been undertaken in Mauritius. In this modern era,

with the emergence of the blue economy and sustainable development goal (SDG) targets, policy makers are committed to prioritize the conservation and management of coastal and marine living resources. This study sheds light on how to achieve the proper management of the mangrove ecosystem for future generations with respect to SDG 14 which calls for conservation and sustainable use of the oceans, seas and marine resources.

## Methodology

### Study site description

The study was carried out along the south west coast of Mauritius (Fig. 1) which spans a total area of 10 km<sup>2</sup> and comprises the districts of Savanne (20.4740° S, 57.4854° E) and Black River (20.3708° S, 57.3949° E) with a total population of 31,228 (Statistics Mauritius, 2011). The mangrove areas selected for this study occur in the following areas: 1) Pointe Koenig – Tamarin (5 km<sup>2</sup>); 2) Case Noyale (2.6 km<sup>2</sup>); 3) Maconde area (1.2 km<sup>2</sup>); and 4) St Martin area (1.2 km<sup>2</sup>). The study areas are mostly dominated by large patches of *Rhizophora mucronata* with few patches of *Brugueira gymnorhiza*. Mangroves in the south west of Mauritius are utilized by some local people as fishing grounds and most of the houses are located adjacent to the coastal road where the mangrove ecosystems and the livelihood of the inhabitants are directly linked to the sea.

### Survey design and structure

The survey questionnaires were designed in electronic format using the Adobe Acrobat X Pro software in English and Mauritian Creole. By using a PC tablet to minimize the administrative cost of printing questionnaires, a pre-test survey was conducted on a sample of 15 randomly chosen households to ensure questions were not too lengthy and understandable to the respondents. The questionnaires were arranged in three sections: information and household views about the mangroves (Section A); socioeconomic background and household characteristics (Section B); and how local residents value the tangible and non-tangible benefits derived from the mangrove ecosystem services (Section C).

Section A of the questionnaire focused on the details of the goods and services derived from the mangrove ecosystem which are regrouped into seventeen criteria as presented by Costanza and Folke (1997) and Rönnbäck *et al.* (2007). These ecosystem services include 1) Gas regulation, 2) Climate regulation, 3) Disturbance regulation, 4) Water regulation, 5) Water supply, 6) Erosion control and Sediment reten-

tion, 7) Soil formation, 8) Nutrient cycling, 9) Waste treatment, 10) Pollination, 11) Biological control, 12) Refugia, 13) Food production, 14) Raw materials, 15) Genetic resources, 16) Recreation, and 17) Cultural Value. Using the Likert scale, values ranging from 5- for strongly agree, 4- for agree, 3- for neutral, 2- for disagree and 1- for strongly disagree, were recorded for each of the seventeen criteria (Vo and Kuenzer, 2012).

interview (Otieno, 2015). Respondents were selected in each district by probability sampling. This procedure is strongly recommended to be used in household surveys (United Nations, 2008). It consists of inferring the sample estimates to represent the total population from which the sample was drawn. This ensured that the number of respondents per *sitio* was proportional to their respective population.

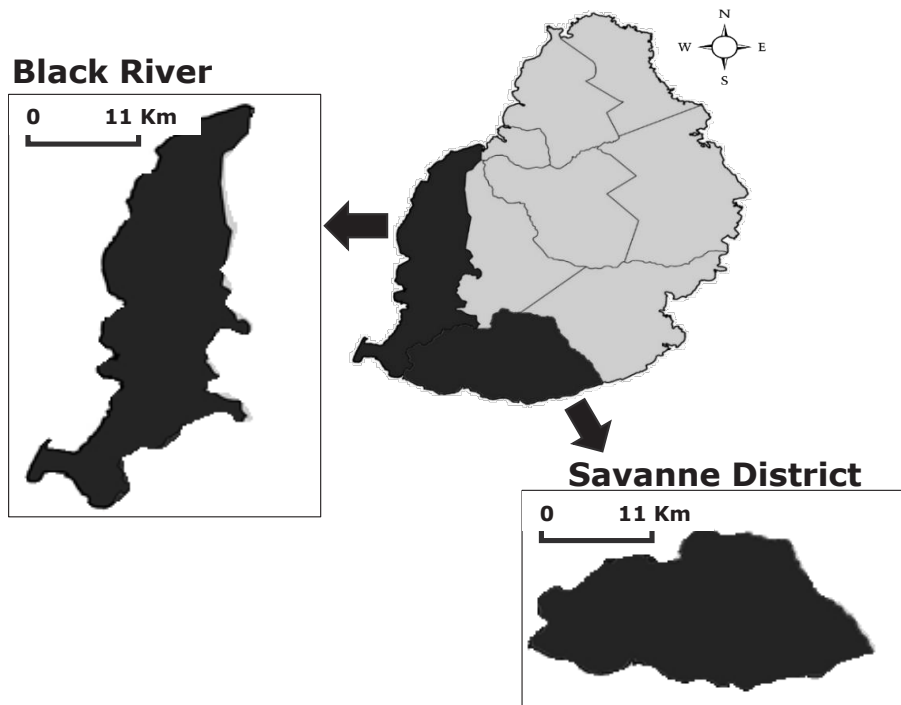


Figure 1. The south west region of Mauritius.

Section B of the questionnaire was designed to seek information on socio-economic characteristics such as age, gender, education level, income, occupation, number of household members, and resident status. Section C of the questionnaire required information on how local residents value the tangible and non-tangible benefits derived from the mangrove ecosystem services. Respondents were asked whether they would be willing to invest some of their money, time or both to help in the conservation of the goods and services of the mangrove ecosystems. Those who responded positively were asked how much money, time or both they would be willing to contribute per month (O'Garra, 2007).

#### Survey procedure and data collection

The study used Slovin's formula with 7% margin of error to determine the number of household respondents to

Data were collected from households in the south west region of Mauritius using a PC tablet. The data were stored in the device with a specific reference code prior to analysis. A sample of 269 households in the Savanne district were approached for the survey and 142 responded favourably. Eighty-one respondents chose to fill the questionnaires in Mauritian Creole language. In the Black River district, 268 households were approached and 126 responded favourably. Out of the 126 respondents 93 chose Mauritian Creole as the medium to fill in the survey questionnaire and the rest chose English.

#### Data analysis

Descriptive statistics were used to summarize and describe the primary data collected from the household survey through tables and discussion of the

results using Microsoft Excel 2016 software and the statistical software SPSS v21.

For section A of the questionnaire, the computation of awareness score of respondents was carried out by adding up the response (using the Likert scale, in SPSS Software) to seventeen statements which depicted the details of goods and services from the mangrove ecosystem. The awareness score was computed in three distinct categories: 1) low awareness (17-33.5), 2) moderate awareness (33.5-68.5), and 3) high awareness (68.5-85).

## Results

### Socio-demographic profile of local residents

The socio-demographic profile of respondents as detailed in Table 1 showed that 69 % of respondents in Savanne and 72 % in Black River districts were male. The percentage of married respondents in the district of Savanne was 47.9 % as compared to that of Black River district which was 65.9 %. The majority of respondents in both Savanne (81 %) and Black River districts (86 %) belonged to the age group 31-60 (Table 1).

Table 1. Socio-economic characteristics of respondents in Savanne and Black River Districts. (Rs1 = USD0.026).

Socio-economic characteristics	Savanne District		Black River District	
	Frequency	Per cent	Frequency	Per cent
<b>Household Size</b>				
< 4	56	39.4	50	40
≥ 4	86	60.6	76	60
<b>Age</b>				
< 30	14	9.9	6	4
31 - 60	115	81	108	86
> 61	13	9.1	12	10
<b>Gender</b>				
Male	98	69	72	57
Female	44	31	54	43
<b>Education</b>				
Literate	7	95.1	125	99.2
Illiterate	135	4.9	1	0.8
<b>Marital Status</b>				
Single	46	32.4	15	11.9
Married	68	47.9	83	65.9
Widowed	16	11.3	11	8.7
Divorced	3	2.1	4	3.2
Cohabitant	9	6.3	13	10.3
<b>Occupation</b>				
Fishing	17	12	3	2
Crop Farming	14	9.9	12	10
Business	7	4.9	7	6
Salary	49	34.5	49	39
Wage	11	7.7	44	35
Remittance	44	31	11	9
<b>Income (MUR)</b>				
< 5000	8	5.6	13	10
5000 - 25000	82	57.7	81	65
> 25001	52	36.7	31	25

Table 2. Valuation of mangrove products.

Mangrove Products	Frequency of respondents Savanne District (n=142)			Frequency of respondents Black River District (n=126)				
	0 USD	>14 USD	14 – 55 USD	0 USD	15 – 55 USD	56 – 96 USD	97 – 136 USD	137 – 178 USD
Fish	10.6	2.1	0.7	3.2	4.0	0.8	0.8	0.8
Crabs	9.2	2.8	1.4	4.8	1.6	0.8	2.4	0
Oyster	12.0	1.4	0	8.7	0.8	0	0	0

The overall number of residents per household in both districts were four, or more than four (60.6 % in Savanne and 60 % in Black River districts). Education levels were quite high among the respondents. On average, most of the respondents had basic primary level education (99.2 %), with a small proportion not completing primary education, or having no formal education (0.8 %).

**Livelihoods of local communities**

As shown in Table 1, formal employment provided the major source of income along the south western region of Mauritius (34.5 % of respondents for Savanne district and 39 % for Black River district). Besides formal employment, some respondents were engaged in other income generating activities such as crop farming, entrepreneurship, and fishing. The yearly income of 57.7 % of respondents in Savanne and 65 % of respondents in Black River district varied from USD135 to USD680. In contrast, 5.6 % and 10 % of respondents in Savanne and Black River districts earned less than USD135.

**Household source of income derived from the mangrove ecosystems**

Fish, crabs and oysters, as shown in Table 2, were those products which generated a monthly income in both Black River and Savanne district. Of these, fish were the highest income generator, which ranged from 0 to USD55 in the Savanne district as compared to that of Black River which was 0 to USD178. The second

highest income generator was crabs, which generated income in the range of 0 to USD55 in the Savanne district and 0 to USD136 in the Black River district. Oysters were the lowest income generator, which varied from 0 to USD14 in both districts.

**Awareness level of local residents**

The results in Table 3 show that the awareness score ranged from 44 to 69, with a mean value of 52.3 and a standard deviation of 4.8 for the district of Savanne. Similarly, in Black River, the awareness score varied from 29 to 69, with a mean value of 53.8 and a standard deviation of 9.0. A higher frequency value for the “moderate awareness” category (99.3 %) was noted in the district of Savanne as compared to the “high awareness” category (0.7 %). On the other hand, in the Black River district 96.1 % respondents were under the category “moderate awareness”, 0.8 % respondents in the category of “high awareness” and 2.4 % respondents in the “low awareness” category. This confirmed that in Mauritius the great majority of local residents were aware to a certain extent of the goods and services provided by the mangrove ecosystems.

Moreover, as illustrated in Table 4, the perception of respondents on the mangrove ecosystems were recorded in the Savanne and Black River districts. Respondents with the opinion “I have no idea” for both Savanne (24 % Male, 11 % Female) and Black River (11 % Male, 13 % Female) districts were significant. In contrast, respondents who felt that “It is an eyesore

Table 3. Awareness Score, and descriptive statistics of respondents in the districts of Savanne and Black River.

Districts	Awareness Score		Mean	Standard Deviation
	Minimum	Maximum		
Savanne	44	69	52.3	4.8
Black River	29	69	53.8	9.0

Table 4. Percentage of respondents according to their views in the districts of Savanne and Black River.

Respondent's Views	Savanne		Black River	
	Male	Female	Male	Female
"It is an eyesore obstructing the beautiful scenery of the sea"	12%	8%	24%	10%
"It is nothing more than a group of trees growing in the coastal area of the sea"	5%	8%	11%	5%
"It has great economic values to the local people"	15%	3%	16%	8%
"It provides a beautiful coastal scenery"	14%	1%	1%	7%
"I have no idea"	24%	11%	11%	13%

obstructing the beautiful scenery of the sea" (12 % Male, 8 % Female respondents for Savanne district; and 24 % Male, 10 % Female respondents for Black River district) were relatively common. However, respondents also felt that "It has great economic value to the local people" (15 % Male, 3 % Female respondents for Savanne district; and 16% Male, 8% Female for respondents for Black River district), and "It provides a beautiful coastal scenery" (14 % Male, 1 % Female respondents for Savanne district; and 1 % Male, 7 % Female for Black River district).

#### Investment for conservation of mangroves

A majority of 88.1 % of local residents in the district of Savanne and 92.1 % in the Black River district as detailed in Table 4 were not in favour of any form of investment to protect and conserve the mangrove ecosystems. However, 3.9 % (Black River) and 4.2 % (Savanne) of respondents were in favour of investing for conservation of mangroves in terms of money. Moreover, 4 % of respondents in the district of Black River and 7 % in the district of Savanne were in favour of dedicating some of their time for conservation

activities. Only 0.7 % of respondents in the district of Savanne agreed to contribute both forms of investment (money and time).

As illustrated in Table 5, the mean monthly investment in terms of money was estimated to the nearest Rupee value and found to be USD0.14 for the district of Black River and USD0.30 for the district of Savanne, respectively. The mean monthly time which respondents were agreeable to dedicate for the conservation of the mangrove ecosystems were 0.8 hours (Savanne District) and 0.7 hours (Black River District) respectively.

## Discussion

### Socio-demographic profile of local residents

The socio-economic and demographic results of this study indicated that people living along the south west coast of Mauritius were composed of nuclear families with two adults and one child on average and an average household size of 3.9. The local communities were mostly middle class, with the majority of head of households in the age group 41-50 years old, and had completed post-secondary education.

Table 5. Investment mode for conservation of mangroves.

Type of Investment	Savanne District		Black River District	
	Percentage of Respondents	Mean Monthly Contribution	Percentage of Respondents	Mean Monthly Contribution
Money	4.2	0.30 USD	3.9	0.14 USD
Time	7.0	0.8 Hours	3.9	0.7 Hours
Both	0.7	0	0	0



The majority of family heads were the sole bread winner and also obtained their monthly income through formal employment in different sectors. Therefore, in this study poverty was insignificant as compared to a similar study in Kenya where local communities were found to be highly dependent on the mangroves as a means to diversify their source of income due to lack of other opportunities and low levels of education (Okello, 2019).

This study revealed that the local communities generally displayed a unique attitude towards the protection of natural resources. As in other developing-economy studies (Whittington, 2004), local respondents were willing to invest only limited resources (USD0.14 for the district of Black River and USD0.30 for the district of Savanne) towards the protection of natural resources on a monthly basis. This represents approximately 0.05 % to 2.5 % of the respondent's monthly household income. However, the direct willingness to contribute (WTC) either money or time was a new concept to respondents and was not viewed as a priority or duty. The current belief was that protection and conservation of the mangrove ecosystem should be ensured by the authorities and not by them. The island of Mauritius is a welfare state with a different culture from other developed countries where it is common practice to contribute to the goods and services of the mangrove ecosystems. Hence, in the local context respondents were less likely to participate or contribute in conservation activities for the protection of mangroves at the study sites. This however does not imply that they are not concerned about the mangroves especially during a moment of crisis. The strong involvement and mobilization of Mauritian communities was clearly demarcated when mangroves on south east coasts were affected by a recent oil spill and several people contributed to fund raising and donations to NGOs for mitigating the impacts (Lee, 2020).

#### **Utilisation of mangrove goods and services by local residents**

In past decades, people who lived adjacent to the mangrove ecosystems were highly dependent on them for various fishery and forestry products for domestic and commercial purposes (Malik, *et al.*, 2015). This was a way to diversify their source of income (Cinner *et al.*, 2009). In a study conducted by Okello (2019) in Kenya, a high reliance on mangroves for livelihoods was noted. This was mainly because 62 % of the Kenyan coastal population were living below the poverty threshold of USD1.25 per

day (Okello, 2019). However, in the present study, the great majority of respondents living along the south west coast of Mauritius were in the middle or low-income class who obtained their monthly income through formal employment in different sectors. Hence, they are economically independent on the mangrove ecosystem.

Fish, crabs and oysters were considered to be making significant economic contribution to the welfare of a small proportion of local communities living along the south west coast of Mauritius. The socio-economic survey carried out in this study showed that maximum earnings of USD178 for fish, USD136 for crabs and USD55 for oysters were collected per head of household when selling those mangrove products on a monthly basis. This revealed the economic value associated with the extractive uses of the mangrove ecosystems in Mauritius. To date this study is among the first to investigate the direct use value of the mangrove ecosystems in Mauritius. Local communities living adjacent to the study area were able to describe some of the goods and services of the mangrove ecosystem. This is due to their frequent interaction with the mangroves for either subsistence needs or recreational purposes.

#### **Perception of local residents towards the goods and services of the mangroves**

The mangrove ecosystem provides an enormous array of ecological and economic benefits to the local community at large. Nevertheless, the extent to which the local residents are aware about those benefits has never been studied before in Mauritius. The awareness level of the local community towards the goods and services provided by mangroves was moderate. The local communities were not fully aware of all the benefits that a mangrove ecosystem can provide. Of the 17 proposed goods and services of the mangroves, only 6 services were positively recognized. These were 1) climate regulation, 2) disturbance regulation, 3) waste treatment, 4) erosion control/sediment retention, 5) recreational, and 6) cultural value. The awareness level was quantified and the result showed a moderate level of awareness. However, the opinions of male and female respondents varied significantly (Table 4) at the study sites. This indicated that with more awareness, the high frequency of respondents who opined "I have no idea" and "It is an eyesore obstructing the beautiful scenery of the sea" would decrease. Consequently, the findings of this study are interesting and unique in the sense that studies from other counties (Okello, 2019; Naylor *et al.*, 1998)

reported that local communities who lived adjacent to mangrove ecosystems had an adequate level of knowledge on their goods and services. Thus, it is apparent that public understanding and awareness with respect to the mangrove biological and economical values can be improved if the local community is made aware of the full potential benefits that could be derived from the mangrove forest (Rahman and Asmawi, 2016). As proposed by Sayers (2006), this can be achieved by educating and informing people in order to raise their awareness on all the goods and services of the mangrove ecosystems. Ultimately, this will ensure the proper management of the mangrove ecosystem for the benefit of future generations in Mauritius.

## Conclusion

This study demonstrated that mangroves along the south west coast of Mauritius have economic and ecological significance to the local communities. However, knowledge of the goods and services of the mangroves at the study sites were moderate amongst local residents. This implies that conservation campaigns and education programmes are essential to raise local concern towards the protection and conservation of the mangrove ecosystems in order to guarantee future generations of the same benefits that they currently provide. To achieve both sustainable blue growth and SDG-14, a comprehensive and strategic plan is required to educate coastal communities on the need for the protection and conservation of mangroves in Mauritius.

## Acknowledgements

The authors are thankful to all respondents who participated in this study and to Mrs Kalei Lutchmanen for translating the questionnaire in “kreol Mauricien”. The study forms part of a Masters thesis in Coastal and Ocean Management at the University of Mauritius.

## References

- Alongi D M (2002) Present state and future of the world's mangrove forests. *Environmental Conservation* 29 (3): 331-349
- Bosire J, Mangora M, Bandeira S, Rajkaran A, Ratsimbazafy R, Appadoo C, Kairo J (eds) (2016) *Mangroves of the Western Indian Ocean: status and management*. WIOMSA, Zanzibar Town. 161 pp
- Chiesura A, De Groot R, (2003) Critical natural capital: a socio-cultural perspective. *Ecological Economics* 44 (2-3): 219-231
- Chow J (2015) Spatially explicit evaluation of local extractive benefits from mangrove plantations in Bangladesh. *Journal of Sustainable Forestry* 34 (6-7): 651-681
- Cinner JE, Mcclanahan TR, Daw TM, Graham NA, Maina J, Wilson SK, Hughes TP (2009) Linking social and ecological systems to sustain coral reef fisheries. *Current Biology* 19 (3): 206-212
- Costanza R, Folke C (1997) Valuing ecosystem services with efficiency, fairness and sustainability as goals. *Nature's services: Societal dependence on natural ecosystems*. pp 49-70
- Duke NC, Zuleika M, Pinzon S (1992) Aging *Rhizophora* seedlings from leaf scar nodes: a technique for studying recruitment and growth in mangrove forests. *Biotropica*: 173-186
- FAO (2005) *Global forest resources assessment 2005 Thematic study on mangroves* [<http://www.fao.org/forestry/9196047cfe8dcf87e2ed2082a4abc28e43d38.pdf>]
- Fatoyinbo TE, Simard M (2013) Height and biomass of mangroves in Africa from ICESat/GLAS and SRTM. *International Journal of Remote Sensing* 34 (2): 668-681
- Giri C, Ochieng E, Tieszen LL, Zhu Z, Singh A, Loveland T, Masek J, Duke N (2011) Status and distribution of mangrove forests of the world using earth observation satellite data. *Global Ecology and Biogeography* 20 (1):154-159
- Gopala SK (1980) Mangrove restoration, propagation and sustainable coastal ecology in Mauritius-The contributions of an NGO and women. pp 1-6 [[https://www.academia.edu/12181016/Mangrove\\_Restoration\\_Propagation\\_and\\_Sustainable\\_Coastal\\_Ecology\\_in\\_Mauritius\\_The\\_contributions\\_of\\_an\\_NGO\\_and\\_women\\_Sandeep\\_Kumar\\_Gopalal\\_Association\\_Pour\\_le\\_D%C3%A9veloppement\\_Durable\\_ADD](https://www.academia.edu/12181016/Mangrove_Restoration_Propagation_and_Sustainable_Coastal_Ecology_in_Mauritius_The_contributions_of_an_NGO_and_women_Sandeep_Kumar_Gopalal_Association_Pour_le_D%C3%A9veloppement_Durable_ADD)]
- James GK, Adegoke JO, Osagie S, Ekechukwu S, Nwilo P, Akinyede J (2013) Social valuation of mangroves in the Niger Delta region of Nigeria. *International Journal of Biodiversity Science, Ecosystem Services & Management* 9 (4): 311-323
- Lee S (2020) Help Mauritius survive Wakashio — a guide for the Mauritian diaspora [<https://medium.com/@sherrylynnlee/help-mauritius-survive-wakashio-a-guide-for-the-mauritian-diaspora-and-visitors-9efffa36355d>]
- Malik A, Fensholt R, Mertz O (2015) Economic valuation of mangroves for comparison with commercial aquaculture in South Sulawesi, Indonesia. *Forests* 6 (9): 3028-3044
- Naylor R, Drew M (1998) Valuing mangrove resources in Kosrae, Micronesia. *Environment and Development Economics* 3 (4): 471-490

- O'Garra T (2007). Estimating the total economic value (TEV) of the Navakavu LMMA (Locally Managed Marine Area) in Viti Levu Island (Fiji). Coral Reef Initiative for the South Pacific (CRISP) Programme, University of the South Pacific, Suva. pp 74-80
- Okello JA, Alati VM, Kodikara S, Kairo J, Dahdouh-Guebas F, Koedam, N (2019) The status of Mtwapa Creek mangroves as perceived by the local communities. *Western Indian Ocean Journal of Marine Science* 18 (1): 67-81
- Otieno P (2015) Linking economic values of mangrove ecosystems with the governing institutional framework for sustainable management of the Tana Delta, Kenya. Centre for Advanced Studies in Environmental Law and Policy (CASELAP), University of Nairobi: Nairobi, Kenya
- Rahman MA, Asmawi MZ (2016) Local residents' awareness towards the issue of mangrove degradation in Kuala Selangor, Malaysia. *Procedia-Social and Behavioral Sciences* 222: 659-667
- Rönnbäck P, Kautsky N, Pihl L, Troell M, Söderqvist T, Wennhage H (2007) Ecosystem goods and services from Swedish coastal habitats: identification, valuation, and implications of ecosystem shifts. *AMBIO: a Journal of the Human Environment* 36 (7): 534-544
- Sarhan M, Tawfik R (2018) The economic valuation of mangrove forest ecosystem services: Implications for protected area conservation. In: the George Wright Forum 35 (3). The George Wright Society. 341 pp
- Sayers R (2006) Principles of awareness-raising for information literacy: A case study. *Communication and Information, UNESCO*. pp 10-11
- Spalding M (2010) *World atlas of mangroves*. Routledge. London, UK. pp 6-11
- Uddin MS, Van Steveninck EDR, Stuij M, Shah MAR (2013) Economic valuation of provisioning and cultural services of a protected mangrove ecosystem: a case study on Sundarbans Reserve Forest, Bangladesh. *Ecosystem Services* 5: 88-93
- United Nations Statistical Division (2008) *Designing household survey samples: practical guidelines* 98. United Nations Publications. 255 pp
- Vo QT, Kuenzer QM (2012) Review of valuation methods for mangrove ecosystem services. *Ecological Indicators* 23: 431-446