NAIROBI CONVENTION SECRETARIAT

DATA & CONTENT CREATION EXPERT -WIOSAP & SAPPHIRE PROJECTS

REPORT PERIOD: JULY 2019 - NOVEMBER 2019

OUTPUT 4: A DASHBOARD INTEGRATED ON THE NAIROBI CLEARINGHOUSE MECHANISM TRACKING METRICS, PERFORMANCE INDICATORS AND OTHER KEY DATA POINTS RELEVANT TO THE WESTERN INDIAN OCEAN REGION.

18th MAY, 2020

BY

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I. Executive summary

The Nairobi Convention Secretariat engaged an expert in data content creation, metadata development, data analysis, visualization and management for the Nairobi Convention Website and the Nairobi Convention Clearinghouse. The expert was to ensure that the two online platforms website have the relevant contextualized data and knowledge to support the Convention's programme of work and its related projects; 'Implementation of the Strategic Action Programme for the protection of the Western Indian Ocean from land-based sources and activities' (**WIOSAP**) and the Western Indian Ocean Large Marine Ecosystems Strategic Action Programme Policy Harmonisation and Institutional Reforms (**SAPPHIRE**).

The main objectives of the consultancy were;

i. To identify, collate and document the relevant information for Nairobi convention website,

ii. To identify, collate and upload relevant spatial and analog data into the Nairobi Convention Clearinghouse

iii. To create ISO standard metadata content for all the data at the Nairobi Convention Clearinghouse

iv. To develop a dashboard to track metrics, performance indicators and other key data points relevant to the Western Indian Ocean region to simplify complex data sets and provide clearinghouse users with at-a-glance awareness of current environmental situation

These objectives have been achieved by the following outputs:

1. A documentation highlighting the updated information on the Nairobi convention website

2. A documentation for all the data that has been uploaded onto the Nairobi Convention Clearinghouse portal

3. A documentation for all the metadata content for all the data at the Nairobi Convention Clearinghouse

4. A dashboard integrated on the Nairobi clearinghouse mechanism tracking metrics, performance indicators and other key data points relevant to the Western Indian Ocean region.

II. Purpose of the report

This report seeks to showcase **output 4: A dashboard integrated on the Nairobi clearinghouse mechanism tracking metrics, performance indicators and other key data points relevant to the Western Indian Ocean region as defined on the signed contract (attached as Annex I).** This report provides the definition of a data dashboard, its importance, the process of developing the dashboard, samples of dashboards that have been developed as well as the software used to develop the dashboard.

III. Introduction

The Nairobi Convention Clearinghouse is a 'data reference centre' in the Western Indian Ocean region, providing accurate and relevant data and information for improved management and protection of the coastal and marine environment in the Western Indian Ocean region. The clearinghouse aims to satisfy the needs of Contracting Parties in the implementation of the Nairobi Convention and to inform decision making in support of

sustainable development and management of the coastal and marine resources in the Western Indian Ocean.

In 2006 the Nairobi Convention Secretariat developed a project entitled 'Nairobi Convention Clearinghouse Mechanism'. The clearinghouse identified the need for agreed upon guidelines, protocols and standards in spatial data generation, repository, standardization, sharing, dissemination and security imperatives towards enhanced decision-making. The clearinghouse provided a large pool of useful data and the state-of-the-art web-mapping technologies to aid in the visualization of available data. The utilization of the Clearinghouse indicated the value and usefulness to engage in the production of management and decision support tools and products.

IV. Data dashboard

Data dashboards provide a centralized, interactive means of monitoring, measuring, analyzing, and extracting a wealth of insights from relevant datasets in several key areas while displaying aggregated information in a way that is both intuitive and visual. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data.

a) Importance of data dashboard

Good data visualization should simplify data. The data dashboards available in the Nairobi Convention Clearinghouse make analytical tasks, such as making comparisons or understanding causality, providing insights into a data set, exposing and recognizing patterns or relationships easier and more effective. They have resulted in the ability to:

- Quickly identify performance towards goals and objectives.
- Clearly point out that something deserves attention.
- Pinpoint what action needs to be taken.
- Show unpredicted outcomes.
- Build informed decisions based on facts.

V. Data dashboard development and deployment

1. **Setting goals:** This involved understanding the purpose or aim of doing the analysis, the significance of the data and best ways to communicate this information clearly and efficiently. In addition to finding a purpose, I also considered which metrics to track along the way, who the consumers/audience of the visualisation (policy makers, UN agencies etc.) are, how the visualisation will help the audience, what trends to show and how the chart(s) add value for the audience. In the case of the MPA dashboards, I was able to showcase:

a) **Progress per country towards achieving SDG target 14.5** on conserving at least 10% of their coastal and marine areas as an area of their respective EEZs.
b) **Area of MPAs (km2)** in each country. For example, In Seychelles, Aldabra accounts for 50% of the total MPA area. The Europa natural reserve & Ramsar site accounts for 53% of France's total MPA area in its WIO territories.
c) **Reasons for MPAs establishment** e.g., protect nesting habitats, coral reefs, turtles, shell protection, mangroves, tourism etc. In Mozambique, 43% (majority) of MPAs cited protecting and conserving natural resources as the reason for their establishment. 69% (majority) of MPAs in Seychelles cited 'protecting coral reefs as the reason for their establishment'.
d) **What habitats and species** are protected by each MPA, e.g. coral reefs, seagrass, mangroves etc. and maps showing where these habitats and species are found. For example, In Seychelles, pools, algal communities and mud flats are only found in the Aldabra special reserve. In Mauritius, beaches & seagrass beds are found in 89% of the MPAs.
e) How are the **MPAs designated** (marine protected area, marine reserve, fishing reserve, national park, special reserves, coral parks, areas of outstanding beauty, etc.). National parks or national reserves have different meanings in different countries. 33% of Kenya's MPAs are designated as marine national parks (no fishing, construction work or any disturbance is allowed unless with permission) and 61% of MPAs in Mauritius are designated as fishing reserves (Only basket trap and line fishing are allowed in Mauritius fishing reserves).
f) **Types of MPAs** in each country (terrestrial, coastal, offshore, epipelagic etc.). For example, coastal MPAs account for 55% of all the MPAs in South Africa. In Mauritius, coastal MPAs account for 66% of all the MPAs.
g) What is the **purpose of zoning MPAs** (no take, controlled zone, buffer zone, protection zone etc) and the definition of each zone per country. For example, 79% (majority) of South Africa's MPAs are designated as controlled zones and in the United Republic of Tanzania, 62% of the MPAs are designated as no take areas.
h) **Number of MPAs established per year,** as well as year when the largest and smallest MPA (km2) was established. For example, in Madagascar, 72% of the MPAs (the majority), were established in year 2015. In South Africa, 48% of the MPAs were proclaimed in 2019.
i) **Institutions and organisations managing MPAs**. For example, in South Africa, 48% of the MPAs (majority), are managed by DEFF. In Zanzibar, Marine Conservation Unit, manages 55% (majority) of the MPAs.
j) **Status of MPAs management plans,** e.g. 86% of Madagascar MPAs have management plans. 3 out of 4 MPAs managed by the French Ministry for Ecological and Inclusive Transition have management plans. In South Africa, 86% of the MPAs proclaimed in year 2000 have management plans.

k) **IUCN Categories assigned to the MPAs** (Definition of IUCN categories has been given). For example, In Madagascar, MPAs under IUCN category V occupy 65% of the total MPA area. In Mozambique, category V MPAs account for 71% of all the MPAs and 97% of the total MPA area.

l) Where available, charts and maps on **locally managed marine areas** as well as informal community managed areas have been included, for example, in Madagascar and Kenya, respectively.

m) Charts and maps on **proposed MPAs** has also been included where available. For example, Seychelles has proposed to establish 16 MPAs.

2. **Data collection:** This process involved collecting the data that was used in the analysis. The exercise started from the primary sources, also known as internal sources, as well as secondary sources, also known as external sources. For example, I collected a lot of data (primary source) from the Marine Protected Areas (MPA) outlook regional and national chapters (Comoros, France, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, South Africa and Tanzania). Other primary sources of data were the authors of each MPA chapter and each respective country's focal points. Where data was missing, I collected secondary data from sources such as Marine Ecoregions website. The data was on MPAs names, types, area (km2), IUCN categories, habitats & species found in each MPA, etc.

3. **Data cleaning:** This is cleaning and sorting through the collected data.

   a) It involved identifying and purging duplicate data, anomalous data, and other inconsistencies that could skew the analysis.

   b) Restructuring the collected data to make it easier to visualise. For example, names, titles, format, geographic coordinates, etc.

   c) Checking it for accuracy

   d) Developing the database. For example, for the MPA data, the data has been compiled and saved in MSExcel (**Attached as Annex II)**

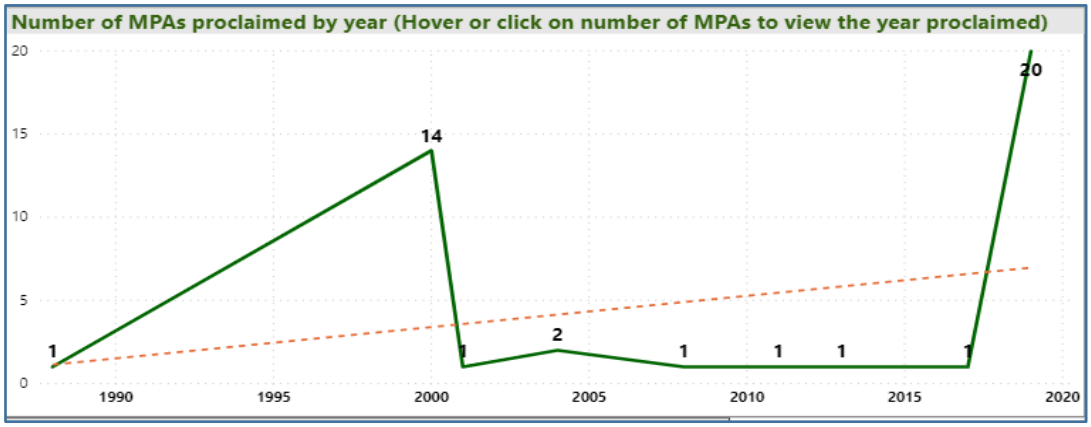
4. **Data Analysis & visualisation:** This involved analysing and manipulating data. The data analysis part of the overall process is very labor-intensive. Statistics need to be compared and contrasted, looking for similarities and differences.

It also involves presenting the information in a visual form, such as graphs, charts, and tables or pictures. The main reason for this is to communicate the information in an easily understandable manner – depending on the data available and the key message or messages the visualisation should convey.

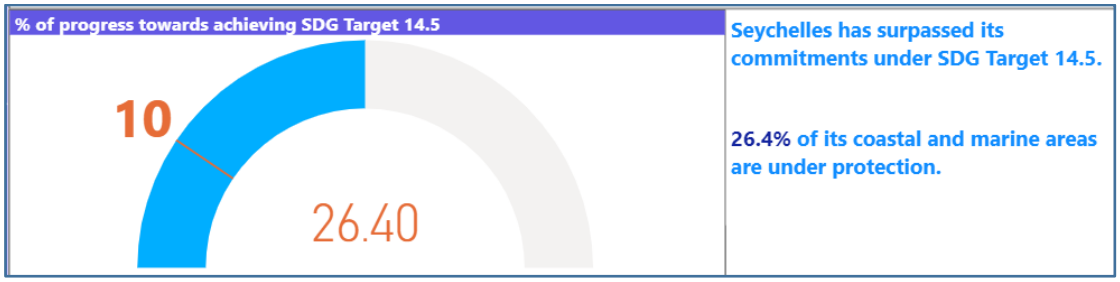
Different charts are best used to show different types of information.

a) **Cards** - To showcase a single number. It can be a single number or multi-row (as shown below):

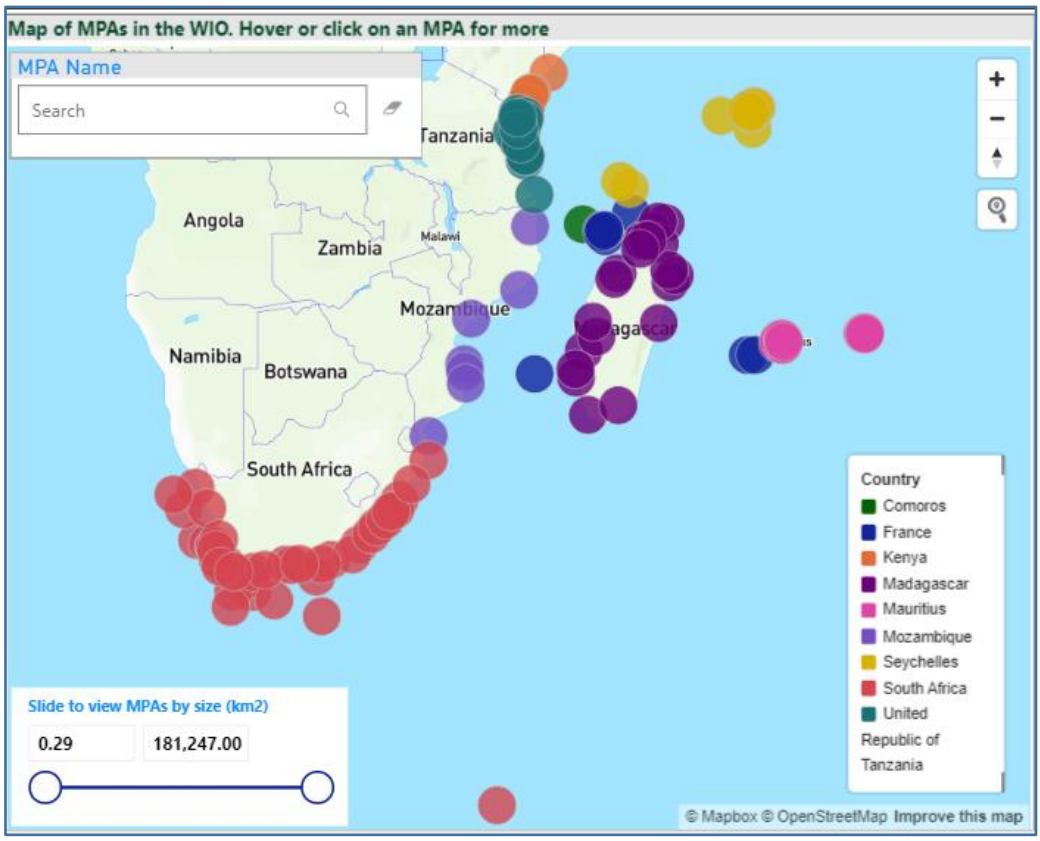
b) **Line charts** - most useful for showing trends over time, or to compare two different variables over time.



c) **Gauge charts** - Displays current status in the context of a goal.



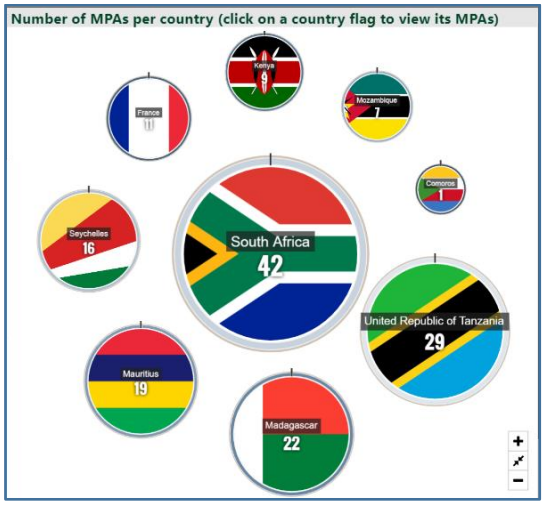
d) **Maps:** Used to associate both categorical and quantitative information with spatial locations.



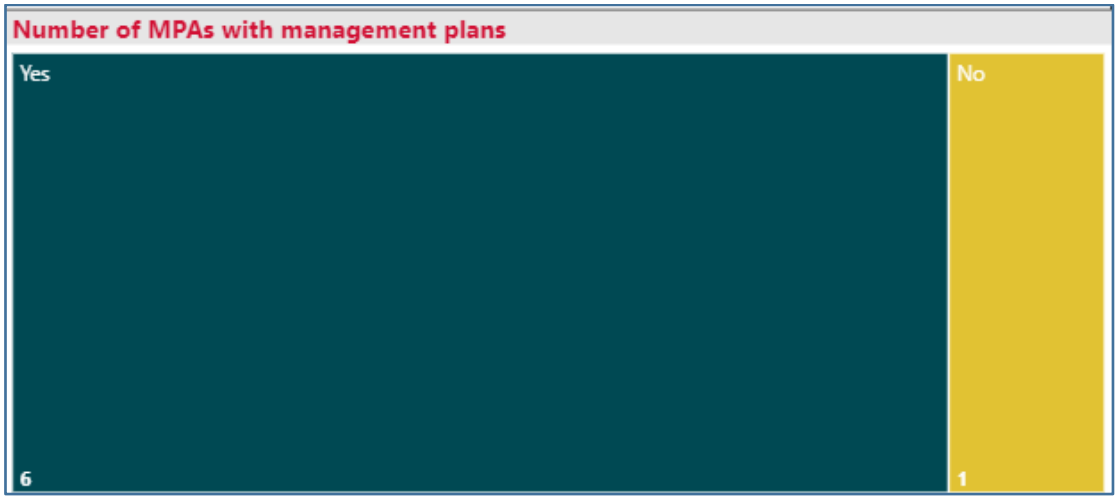
e) **Chicklet slicer:** Display image and/or text buttons that act as an in-canvas filter on other visuals

f) **Word cloud:** Its a visual representation of word frequency and value. I used it to get instant insight into the most important terms in the data.

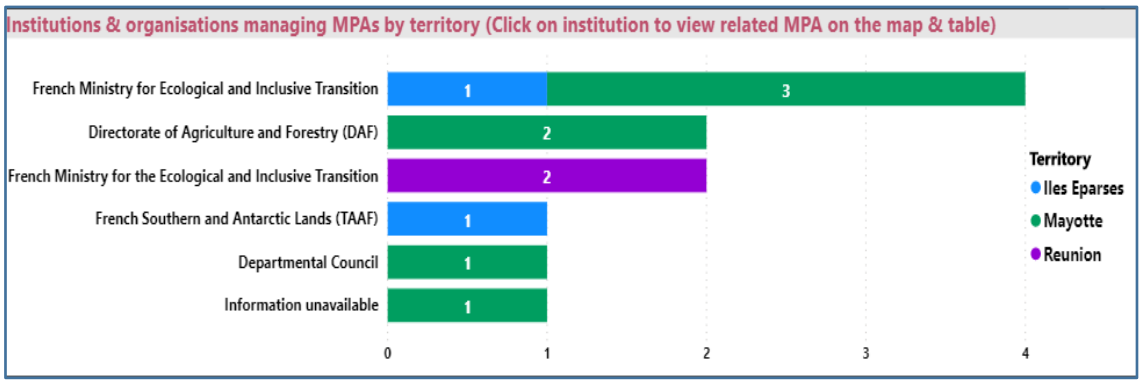
g) **Cluster map** - I used this to display clusters of related data in an expressive image mosaic. Clusters can be arranged in a symmetric "spiral" layout or a more freeform "relational" layout, with cluster proximity in the latter case determined by the relatedness between clusters. Example of chart:



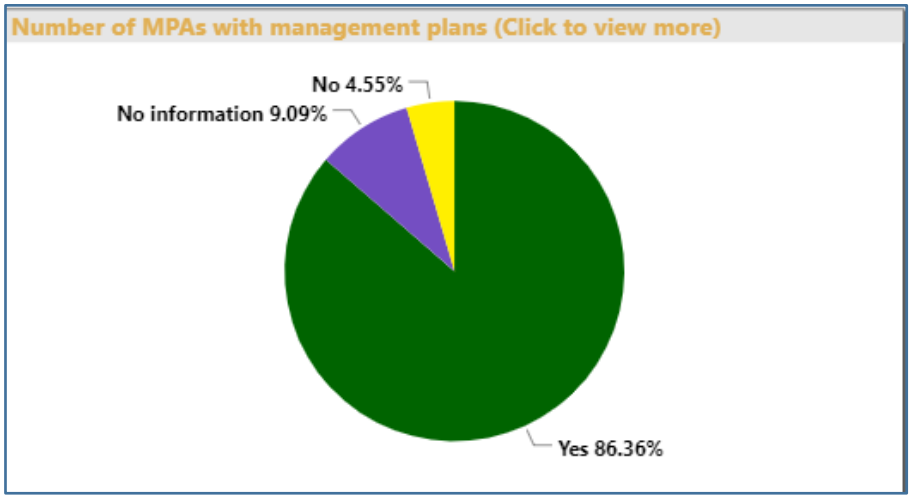
h) **Treemaps** - charts of colored rectangles, with size representing value. They can be hierarchical, with rectangles nested within the main rectangles. Example below



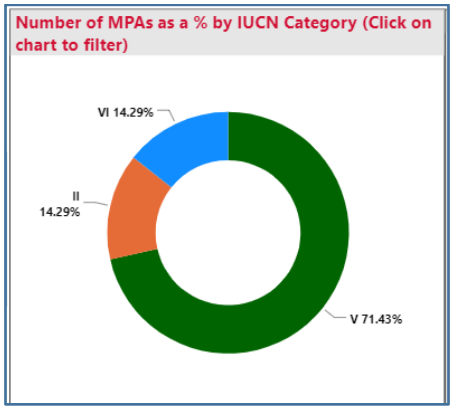
i) **Bar and Column charts** - very useful for the comparison of at least one set of data points



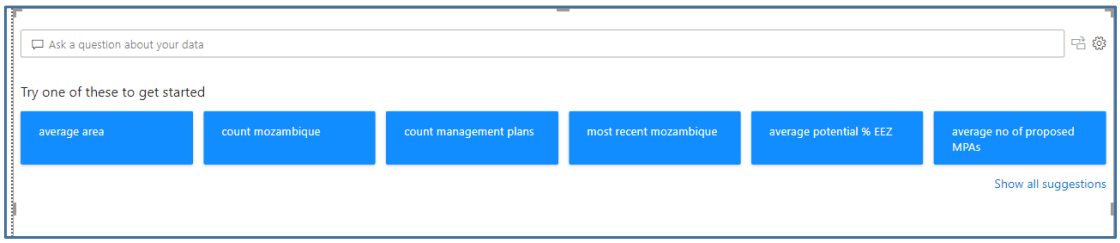
j) **Pie charts** are good for illustrating and showing sample break down in an individual dimension. It is in the shape of a pie to show the relationship between the main and sub-categories of your data.



k) **Doughnut charts** are similar to Pie charts and are good for presenting the relationship between proportions of different data groups.

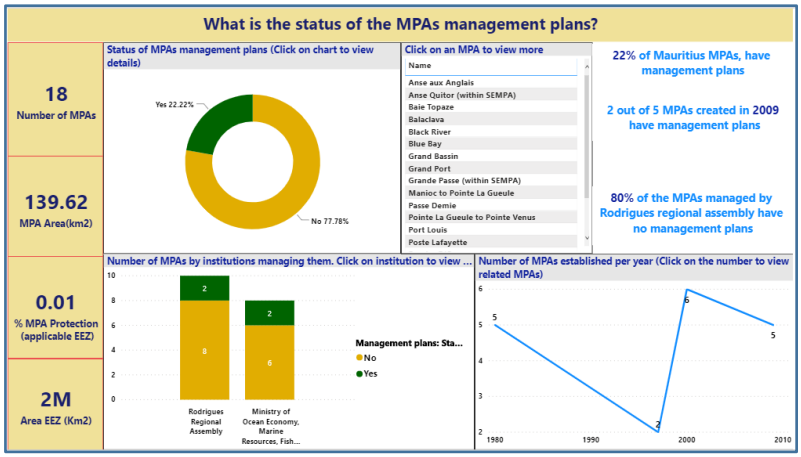


l) **Q&A** visual - the Q&A visual lets users ask questions about the data using natural language



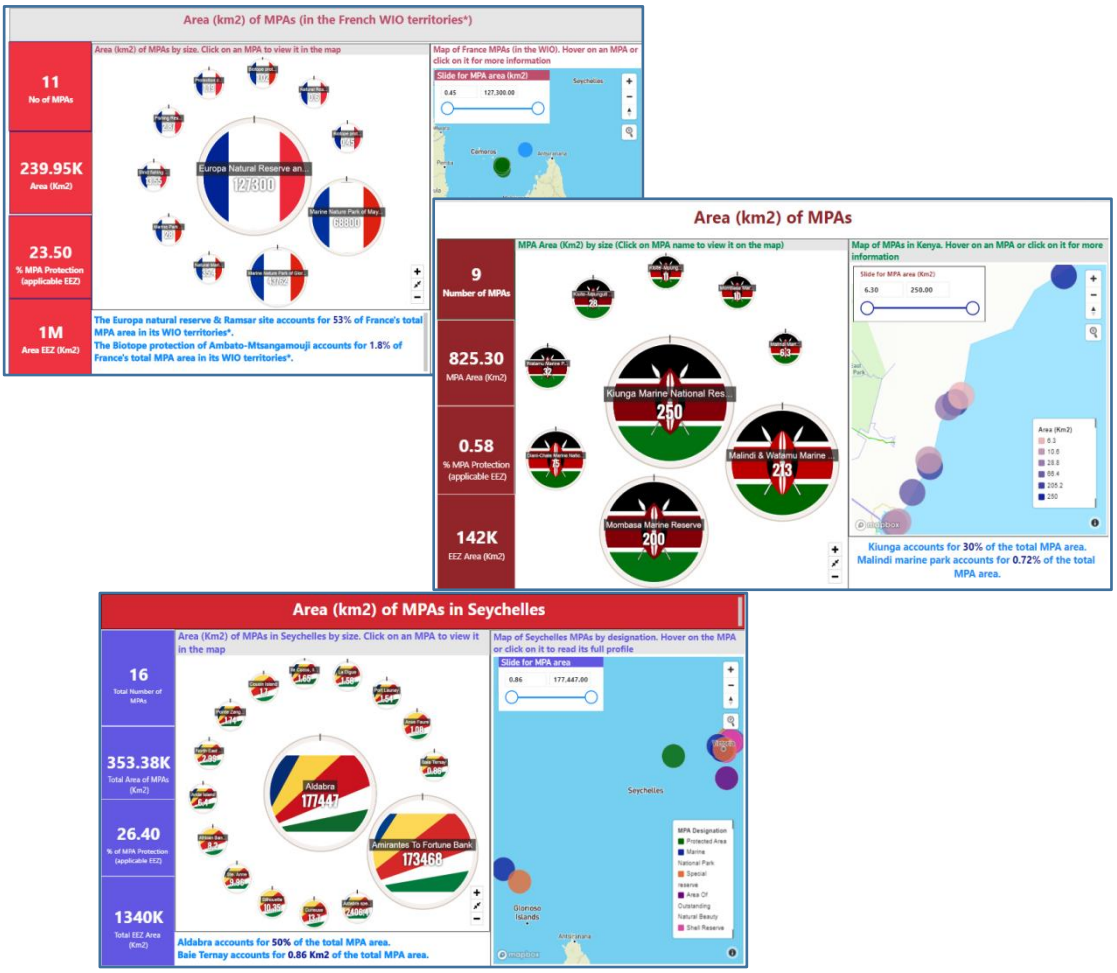
m) **Tables** - Work well with quantitative comparisons among items where there are many categories.

5. The analysis and visualisation also involved looking for similarities and differences as well as patterns and relationships. For example: In this chart from Mauritius, we can see that 80% of the MPAs managed by Rodrigues Regional Assembly have no management plans.

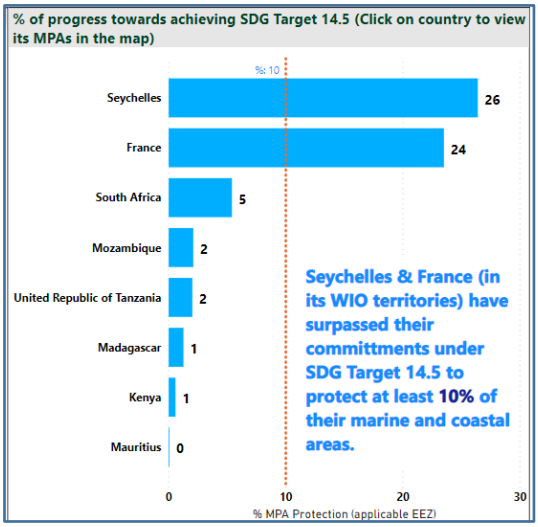


6. **Refine:** This involved improving the visuals by making them more visually appealing and engaging through using various colours, size, scale, shapes and labels to direct attention to the key messages. For example,

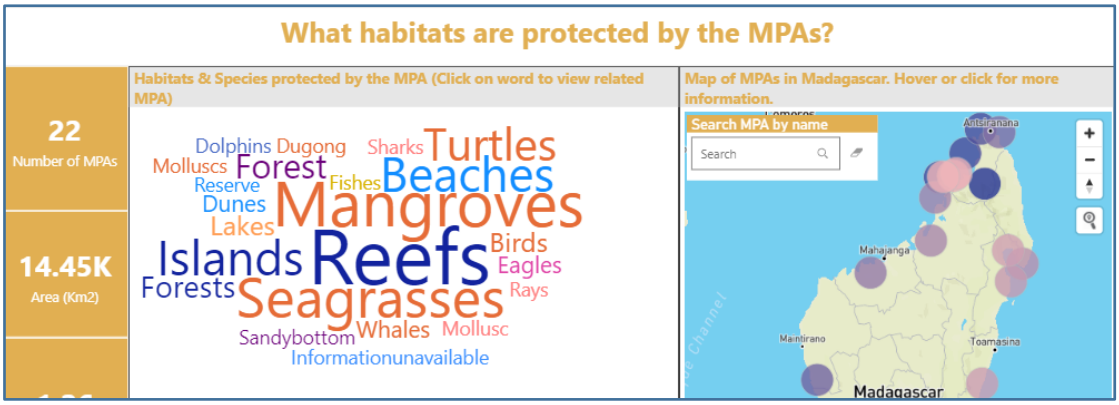
   a) Each country dashboard has been branded with the colours from its national flags to match the country's look and feel. Samples below from Seychelles, France and Kenya.



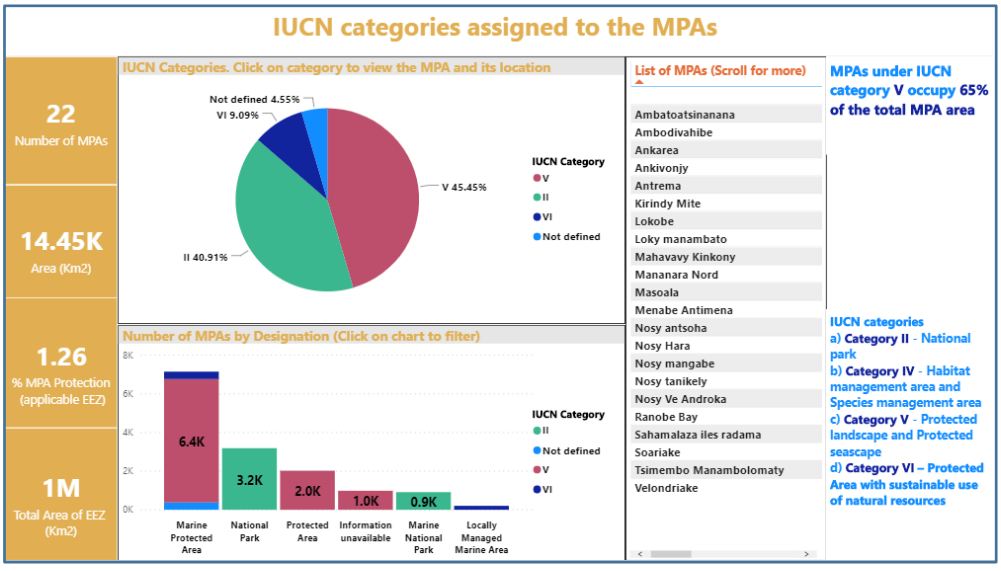
   b) Each chart has a takeaway message with pop out colour to catch the readers attention.



c) Each chart has a title which states a story. Some of the titles give the gist of the findings.



d) For clarity purposes, I included additional notes for those charts that had information which may not be clear to users on first look. Example: This chart shows IUCN categories assigned to MPAs. An additional note on the bottom defines the meaning of each IUCN category



e) The charts have all used custom fonts to make them more outstanding.

7. **Result interpretation** Once the data was sorted and analyzed, the next process was interpretation and answering these questions.

   a) Was the data collected helpful in answering the original purpose of analysis?

   b) Were the results limiting/inconclusive. In such instances, I recommended further research.

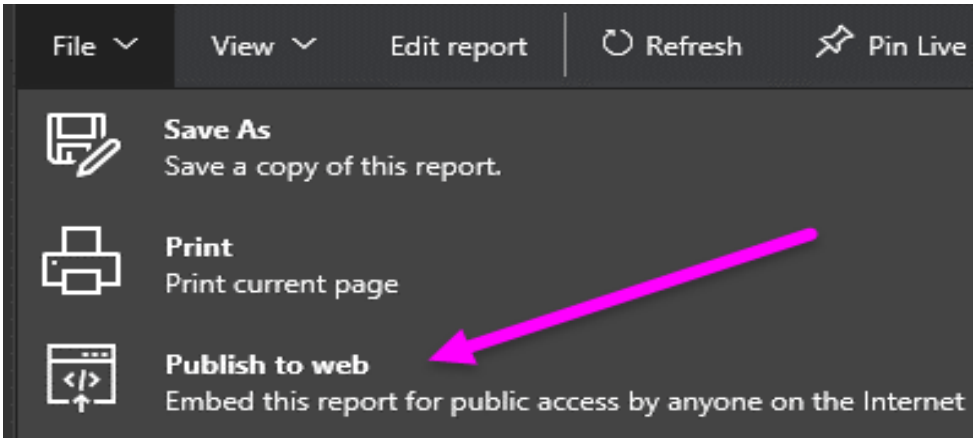
   c) Were new questions revealed that were not obvious before?

8. Publish to Nairobi Convention Clearinghouse from Power BI

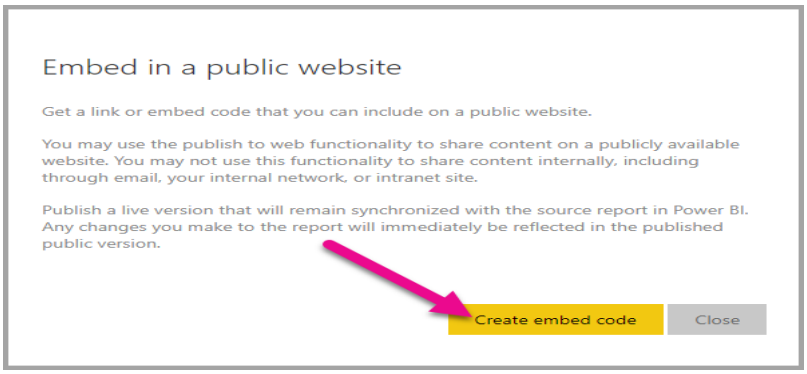
I used Power BI to visualise the data. More information on PowerBI is available in **Annex III**. With the Power BI **Publish to web** option, embedded interactive Power BI visualizations are put into the website. Publish to web allows one to create an embedded code for Power BI report and then use that code in a web page. This simple feature will enable everyone to access the report. They won't be able to edit the report, but they will see the report, and the report will be fully interactive for them so they can highlight items, select slicers, and drill down.

The following steps describe how to I was able to **Publish to web**.

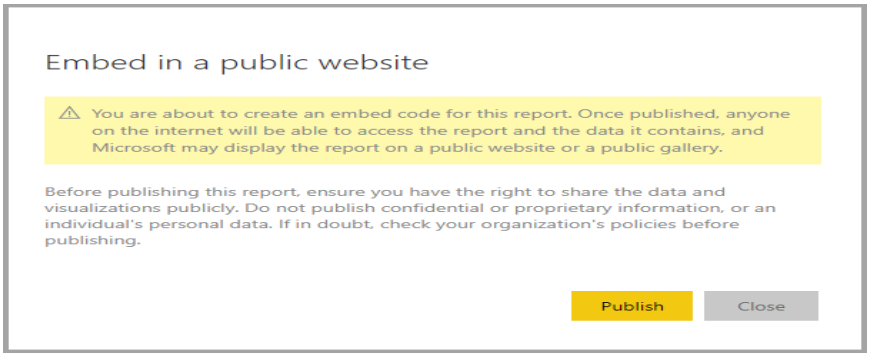
a) I open a report (that I had worked on earlier) in the workspace and select **File > Publish to web**.



b) Review the dialog content and select **Create embed code**.



c) Review the warning, as shown here, and confirm that the data is okay to embed in a public website. If it is, select Publish.

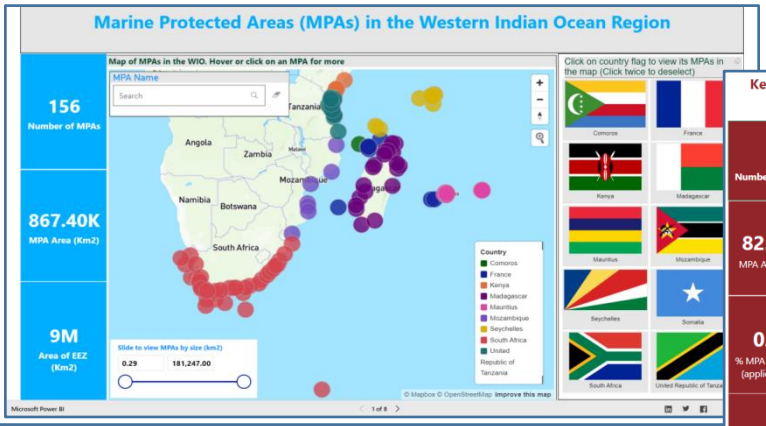


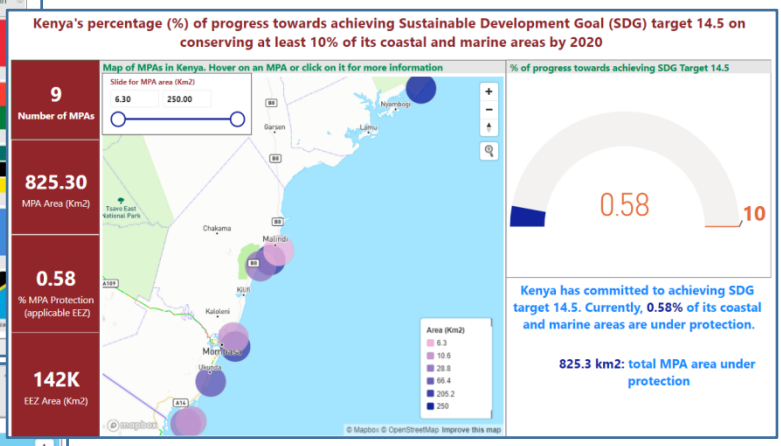
d) A dialog appears with a link. It gives option to send this link in an email, embed it in code such as an iFrame, or paste it directly into the webpage in the Clearinghouse. I choose the option of iFrame which I then copy and paste in the website.

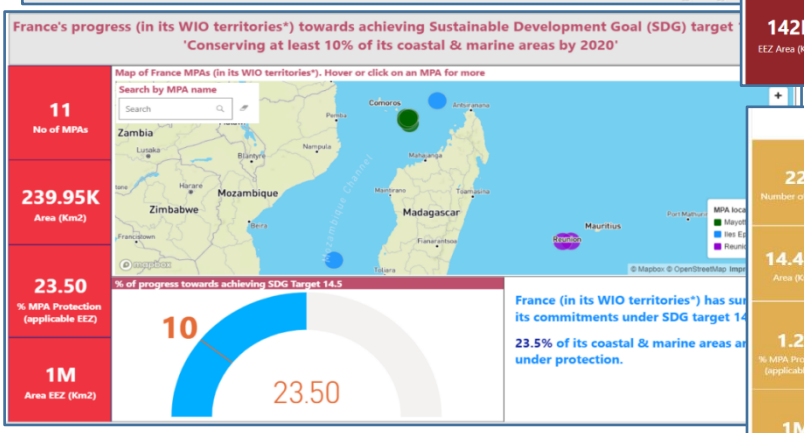
e) For previously created codes, select Publish to web, (dialogs in steps 2-4 are not shown). Instead, the Embed code dialog appears as below:

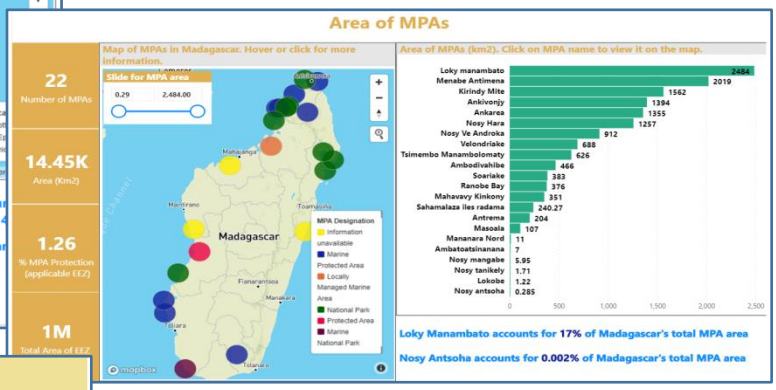
VI. Dashboard samples

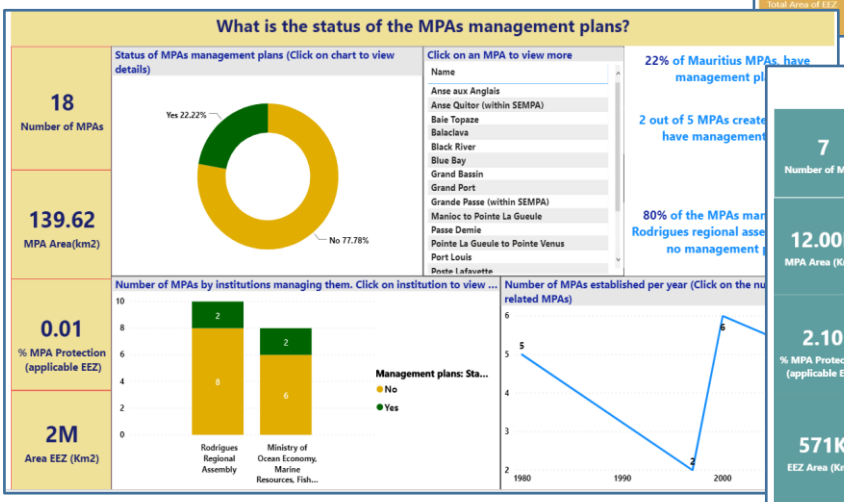
Disclaimer: Data used is only for MPAs. The dashboard can be accessed here: https://www.nairobiconvention.org/clearinghouse/node/427

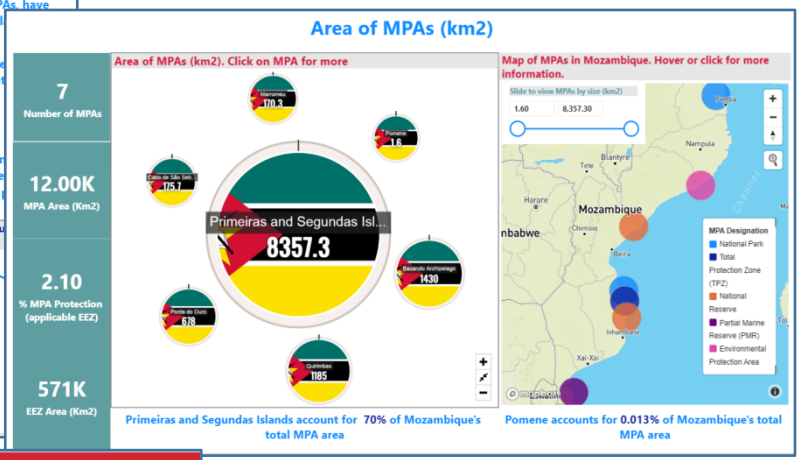

Marine Protected Areas (MPAs) in the Western Indian Ocean Region
156
Number of MPAs
867.40K
MPA Area (Km2)
9M
Area of EEZ (Km2)
Map of MPAs in the WIO. Hover or click on an MPA for more
Click on country flag to view its MPAs in the map (Click twice to deselect)

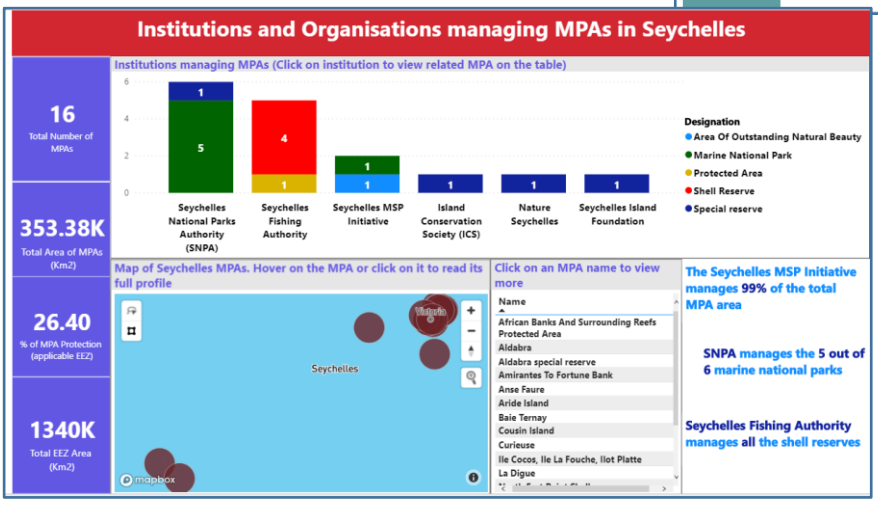

Kenya's percentage (%) of progress towards achieving Sustainable Development Goal (SDG) target 14.5 on conserving at least 10% of its coastal and marine areas by 2020
9
Number of MPAs
825.30
MPA Area (Km2)
0.58
% MPA Protection (applicable EEZ)
142K
EEZ Area (Km2)
Map of MPAs in Kenya. Hover on an MPA or click on it for more information
% of progress towards achieving SDG Target 14.5
0.58
10
Kenya has committed to achieving SDG target 14.5. Currently, 0.58% of its coastal and marine areas are under protection.
825.3 km2: total MPA area under protection


France's progress (in its WIO territories*) towards achieving Sustainable Development Goal (SDG) target 'Conserving at least 10% of its coastal & marine areas by 2020'
11
No of MPAs
239.95K
Area (Km2)
23.50
% MPA Protection (applicable EEZ)
1M
Area EEZ (Km2)
Map of France MPAs (in its WIO territories*). Hover or click on an MPA for more
Search by MPA name
% of progress towards achieving SDG Target 14.5
10
23.50
France (in its WIO territories*) has su
its commitments under SDG target 14
23.5% of its coastal & marine areas ar
under protection.


Area of MPAs
22
Number of MPAs
14.45K
Area (Km2)
1.26
% MPA Protection (applicable EEZ)
1M
Total Area of EEZ
Map of MPAs in Madagascar. Hover or click for more information.
Area of MPAs (km2). Click on MPA name to view it on the map.
Loky manambato 2484
Menabe Antimena 2019
Kirindy Mite 1562
Ankivonjy 1394
Ankarea 1355
Nosy Hara 1257
Nosy Ve Androka 912
Velondriake 688
Tsimembo Manambolomaty 626
Ambodivahibe 466
Soariake 383
Ranobe Bay 376
Mahavavy Kinkony 351
Sahamalaza iles radama 240.27
Antrema 204
Masoala 107
Mananara Nord 11
Ambatoatsinanana 7
Nosy mangabe 5.95
Nosy tanikely 1.71
Lokobe 1.22
Nosy antsoha 0.285
Loky Manambato accounts for 17% of Madagascar's total MPA area
Nosy Antsoha accounts for 0.002% of Madagascar's total MPA area


What is the status of the MPAs management plans?
18
Number of MPAs
139.62
MPA Area(km2)
0.01
% MPA Protection (applicable EEZ)
2M
Area EEZ (Km2)
Status of MPAs management plans (Click on chart to view details)
Yes 22.22%
No 77.78%
Click on an MPA to view more
Anse aux Anglais
Anse Quitor (within SEMPA)
Baie Topaze
Balaclava
Black River
Blue Bay
Grand Bassin
Grand Port
Grande Passe (within SEMPA)
Manioc to Pointe La Gueule
Passe Demie
Pointe La Gueule to Pointe Venus
Port Louis
Poste Lafayette
22% of Mauritius MPAs have management pl
2 out of 5 MPAs create have management
80% of the MPAs mar Rodrigues regional asse no management
Number of MPAs by institutions managing them. Click on institution to view ...
Rodrigues Regional Assembly
Ministry of Ocean Economy, Marine Resources, Fish...
Management plans: Sta...
No
Yes
Number of MPAs established per year (Click on the nu related MPAs)


Area of MPAs (km2)
7
Number of MPAs
12.00K
MPA Area (Km2)
2.10
% MPA Protection (applicable EEZ)
571K
EEZ Area (Km2)
Area of MPAs (km2). Click on MPA for more
Primeiras and Segundas Isl...
8357.3
Map of MPAs in Mozambique. Hover or click for more information.
Mozambique
Primeiras and Segundas Islands account for 70% of Mozambique's total MPA area
Pomene accounts for 0.013% of Mozambique's total MPA area


Institutions and Organisations managing MPAs in Seychelles
16
Total Number of MPAs
353.38K
Total Area of MPAs (Km2)
26.40
% of MPA Protection (applicable EEZ)
1340K
Total EEZ Area (Km2)
Institutions managing MPAs (Click on institution to view related MPA on the table)
Seychelles National Parks Authority (SNPA)
Seychelles Fishing Authority
Seychelles MSP Initiative
Island Conservation Society (ICS)
Nature Seychelles
Seychelles Island Foundation
Designation
Area Of Outstanding Natural Beauty
Marine National Park
Protected Area
Shell Reserve
Special reserve
Map of Seychelles MPAs. Hover on the MPA or click on it to read its full profile
Seychelles
Click on an MPA name to view more
African Banks And Surrounding Reefs Protected Area
Aldabra
Aldabra special reserve
Amirantes To Fortune Bank
Anse Faure
Aride Island
Baie Ternay
Cousin Island
Curieuse
Ile Cocos, Ile La Fouche, Ilot Platte
La Digue
The Seychelles MSP Initiative manages 99% of the total MPA area
SNPA manages the 5 out of 6 marine national parks
Seychelles Fishing Authority manages all the shell reserves

VII. Annex I: Signed contract

Hereby attached

VIII. Annex II: Data used for visualisation

Hereby attached

IX. Annex III: Visualisation Software used

Microsoft Power BI was the software that was used for the visualisation. PowerBI is a Data Visualization and Business Intelligence (BI) tool by Microsoft. Power BI converts data from different data sources to interactive dashboards and BI reports. Power BI suite provides multiple software, connector, and services - *Power BI desktop, Power BI service based on Saas, and mobile Power BI apps available for different platforms.* These set of services are used by business users to consume data and build BI reports. Power BI desktop app is used to create reports, while Power BI Services (Software as a Service - SaaS) is used to publish the reports, and Power BI mobile app is used to view the reports and dashboards. Gartner recognizes Microsoft as a Leader for the thirteenth consecutive year in the Gartner 2020 Magic Quadrant for Analytics and Business Intelligent Platforms.

Figure 1. Magic Quadrant for Analytics and Business Intelligence Platforms

Source: Gartner (February 2020)

a) Key features of Power BI

- Power BI Question and Answers -- Power BI can answer your queries regarding the uploaded data. After the data uploaded to Power BI, it would help you with the information required like "what are the total number of Marine Protected Areas in South Africa?" you just have to type the question and it would immediately show the result with beautiful visual or chart.
- Artificial Intelligence – Users can access image recognition and text analytics in Power BI, create machine learning models using automated machine learning capabilities and integrate with Azure Machine Learning.
- Data Connection -- Power BI can get data almost from everywhere. Microsoft has developed data source connections with a huge list of sources like SQL, Azure, Excel, Text, CSV, PDF, Cloud, on-premises data. It doesn't matter where the data is and what format it is we will get a detailed view of the data.
- Power Query, Power Pivot Access -- In Power BI we can edit the data by using "Power Query" and "Power Pivot". These are all different components of Power BI which helps

the user to alter the data in such a way it fits their needs. Power Query is used to data transformation and manipulation tool and Power Pivot is a memory tool to model the data.

- Quick Insights -- This feature allows users to create subsets of data and automatically apply analytics to that information.
- Customization -- Power BI comes with a lot of built-in visuals to build dashboards and reports. Apart from these built-in visuals users are allowed to download the custom visuals from market places as per their requirement..
- APIs for integration -- This feature provides developers with sample code and application performance interfaces (APIs) for embedding the Power BI dashboard in other software products.
- Mobile App -- Power BI app is available to download. This makes the report reaching to the end users much easier and simpler. Once the report is shared with the end-user they need to sit in front of the laptop or system rather they can just open the Power BI app on their mobile and start reading the report instantly.
- Real-time analytics.
- Simple drag and drop method to create visualizations and dashboards
- An easy way of data import and export options.
- Auto-refresh of data in case of a cloud-based data source.
- Interactive dashboard with slicers and filters.
- Easy installation procedures.

b) Power BI cost

There are three levels of Power BI for users: Power BI Desktop, Power BI Pro and Power BI Premium. The desktop version is free, while the Pro model costs $9.99 per user, per month. Pricing for Power BI Premium depends on the size of the deployment and user amount. When you compare Power Bi with other data visualization tools like Tableau, QlikView and other products cost Power BI cost much lesser than that. UNEP and Microsoft have an agreement hence all its products (Outlook, OneDrive, Word, Excel, PowerPoint, OneNote, SharePoint, Microsoft Teams, PowerBI etc) are available to staff at no cost. However, the publish to web comes with its requirements. Staff have to acknowledge that they have read, understand, and will abide by the policies, procedures, and instructions listed in Secretary-General's bulletin on Information sensitivity, classification and handling. Staff have to also acknowledge that they will publish Power BI reports with only **PUBLIC DATA** to the internet via "Publish to Web" functionality and requesting this feature to be enabled for them. **Error! Reference source not found.** Please hold down CTRL+Click to read more on: **Error! Reference source not found.**

c) Power BI Pros

- More affordable than its main competitors and offers a free version
- Intergration with other Microsoft products: Works within a suite of business tools along with Azure, Excel, SQL Server
- Simple Coordination with Excel - Power BI base on an indistinguishable interface from Excel control, so in case you're an Excel control client at that point learning and utilizing Power BI will basic and clear.
- Good Report Perception - Microsoft Power BI has a broad scope of outlining alternatives for picturing your information.

- Broad Database Availability - Power BI can associate and concentrate information from an assortment of information sources like Excel, Access, Adobe Analytics, SQL Server, Azure, Github, Google Analytics, Oracle, PostgreSQL, Salesforce, Teradata, and so on. T
- The built-in library of visuals is impressive and robut, besides there is support for custom VisualsGreat and gentle customer support
- Ability to connect to almost any kind of data source, wither cloud-based or on-premises
- The intuitiveness of the Power BU Interface decisions

d) Power BI Cons

- Due to cost issues, PowerBI can only be available to users who can afford it. Implementing PowerBI at the national level has become a challenge due to cost.
- Unnecessary complexity when stepping outside basic functions especially for users with limited previous exposure to MsExcel
- Performance issues when streaming or importing big data sets in Power BI, such as time-outs and freezes
- Power BI won't acknowledge records bigger than 250 MB.
- There is a 1GB utmost for each dataset. As a workaround, you can make numerous datasets. There is likewise a greatest of 100,000 records in PowerBI.com.