

TECHNOLOGY CONSULTING

IN THE GLOBAL COMMUNITY

Final Consulting Report Palau Conservation Society

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Carnegie Mellon University





Executive Summary

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I. About the Organization

The Palau Conservation Society (PCS) spearheads most of the conservation efforts that take place in Palau. Founded in 1994, the PCS strives to ensure the sustainable growth of the country. As stated on their website:

Our mission is to work with the community to preserve the nation's unique natural environment and perpetuate its conservation ethic for the economic and social benefit of present and future generations of Palauans and for the enjoyment and education of all.

The organization first started its efforts with species-based educational programs. Over the years, the organization has expanded its efforts to numerous other programs that have both local and global impacts. A great portion of Palau's economic growth comes from tourism, subsistence agriculture, and fishing. Since Palau's economy relies heavily on the nation's environment, the stakeholders of the organization and their work have also increased over the years.

Currently, the organization consists of 12 full-time employees and external support from general memberships and corporate partners. However, with the growing demand for conservation efforts in the community, the organization continues to be more active across the multiple programs.

II. Enhance and organize protected areas data

In one paragraph, give a short description and justification for the first goal in the scope of work.

Follow that with a brief description of the outputs and outcomes and major risks to the sustainability of the goal. Bullet points may prove particularly effective in this section.

If you have a recommendation following up on this task, provide a brief description of it.

One problem area in the CPA division and the organization as a whole is the management of new and existing data. After reviewing the type of information collected for CPAs tasks, the consulting partner sees numerous opportunities in not only better organizing the data, but also setting up tools that could help the organization make better use of the available data. The targeted data for this solution would mainly be the scorecard document that is used to organize the list and background information of the protected areas in Palau.

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Final Consulting Report

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I. About the Organization

Organization

The Palau Conservation Society (PCS) spearheads most of the conservation efforts that take place in Palau. The Republic of Palau is an island country located in the Western Pacific. In 1994, the country gained full sovereignty in free association with the United States. Palau follows a similar political system as the United States. This includes an elected president, a bicameral Palau National Congress, and 16 states that represent all the different areas and islands of the country. Palau's economy mainly consists of tourism, subsistence agriculture, and fishing. The country's history of strong environmental conservation has attracted numerous tourists to its rich marine and terrestrial environment. In recent years, Palau has also been an active participant in formulating the 2030 Agenda for Sustainable Development. Furthermore, the Palauan government continues to actively integrate the Sustainable Development Goals (SDGs) into their policies, including their national SDGs framework. To continue this positive trend, elected leaders and policymakers often consult the PCS when dealing with environmental concerns. Founded in 1994, the PCS strives to ensure the sustainable growth of the country. As stated on their website:

Our mission is to work with the community to preserve the nation's unique natural environment and perpetuate its conservation ethic for the economic and social benefit of present and future generations of Palauans and for the enjoyment and education of all.

The organization first started its efforts with species-based educational programs. Over the years, the organization has expanded its efforts to numerous other programs that have both local and global impacts. A great portion of Palau's economic growth comes from tourism, subsistence agriculture, and fishing. Since Palau's economy relies heavily on the nation's environment, the stakeholders of the organization and their work have also increased over the years. This is demonstrated by the extensive [board of director members](#) that come from the private sector, state, and national government, as well as individuals from various other conservation organizations.

Currently, the organization consists of 12 full-time employees and external support from general memberships and corporate partners. However, with the growing demand for conservation efforts in the community, the organization continues to be more active across the multiple programs.

Facilities

The organization consists of one office space located in Bai Ra Maibrel Koror, Palau. The building is located at the shore of the Station Harbor. As for some relevant locations near the office: The office is located near the Palau International Coral Reef Center and the Kereker ra Kosiil Conservation Area. The PCS rents the second floor office of the building. The office building is shared with a fine dining restaurant named Elilai Seaside Dining. Currently, the office has 9 designated workspaces for its employees. Each employee has access to either a desktop computer or a laptop. Furthermore, the office is equipped with necessary office equipment for the organization's daily operations. There are no significant problems concerning the location, infrastructure, furniture, climate controls, or lighting issues that hinder their daily tasks. While no individual has a designated position in maintenance, the staff have been able to resolve minor maintenance issues in the past.

Programs

Currently, the organization has four main programs that they are pursuing. First, is the Conservation and Protected Areas (CPA) program which is the oldest program in the organization. The program strives to encourage community engagement and action in managing critical sites and species. This includes advocating and assisting new conservation areas across the 16 states in Palau. Furthermore, the CPA program assists existing conservation areas by providing management plans and by acquiring financial resources through the Protected Areas Network (PAN) fund. The CPA program also has specific focuses based on the types of species, such as the joint operations with Birdlife International. Recently, they have been focusing their efforts on fisheries across Palau with a goal to track fishing activities across the country to assist state governments with fishery-related policies.

Second, is the Policy and Planning program. This program's mission is to work closely with state and national governments to advocate for policies that ensure that the country can sustainably develop. In order to do this, the PCS consults state and national governments using the Sustainable Land Management approaches to integrate sustainable thinking into all levels of policy planning and management. Currently, this program has two main focuses. The first focus is on the ongoing infrastructural development in Babeldaob which is the largest island in the nation. In recent years, along with Palau's growing economy, there have been numerous developments in Babeldaob. Therefore, one of the main goals of this program is to ensure that these developments do not have negative impacts on the island's environment. The second focus that this program has is on sustainable tourism. As its main economic industry, Palau's tourism sector must be both maintained and developed. This includes working with policies that have economic, social, and legal implications whilst emphasizing the importance of reducing the ecological footprint that results from tourist activities. Therefore, the PCS helps organizations and governments to practice "Responsible Tourism" strategies in their work.

Third, is the Communications and Outreach program. This program focuses on maintaining positive relationships with all stakeholders and the management of environmental information. Through effective communication with community members, this program attempts to raise awareness and cooperation among residents. This includes working with educational institutions to emphasize the integration of environmental subjects into the curriculum.

Finally, the Administration and Development program focuses on the consistent development of the organization. The Administration and Development Program team is responsible for raising awareness of their work and to raise funds for their projects. The organization’s funds mainly come from grants, individual donations, corporate partners, and individual government employees of Palau. By assessing and improving the human, financial, and physical resources of the organization, this program ensures that all the goals and objectives of the organization can be met. As stated on their website:

*The Administration and Development Program continues to promote the **integrity** (one of PCS’s targeted Core Values) and awareness of the organization in the community, and raise funds for its long-term sustainability.*

These four programs represent the main goals and work of the organization. These programs all have their specific focus. As shown in the diagram below, the geographic scope and the core values differ. However, jointly they serve to target the problem areas in regards to sustainability.

Geographic Scope	Program	Targeted Core Value
Site and Community levels	Conservation and Protected Areas Program	Respect for Science
State, Watershed, and National levels	Policy and Planning Program	Belief in Sustainability
National, Regional, and International levels	Communication and Outreach Program	Respect for Palauan Culture
Organizational level	Administration and Development Program	Integrity

Source: Palau Conservation Society

In order for successful operations for each of the programs, technology is used in the organization. Computers are used to utilize basic tools such as Microsoft Excel, Microsoft Word, Google, and more. Furthermore, many of their work is also documented in physical documents. One of the areas of concern is the lack of integration between the four programs. While day-to-day communication exists between staff members working in these different programs, there is no central bank or database that stores work and information. This makes it difficult for staff members to access any information they might need from other departments. Furthermore, the organization has also struggled to organize data and information from past projects that may be needed.

Staff

There are a total of 11 full-time positions in the Palau Conservation Society. There are 4 main divisions in the organization which include: Administration and Development; Conservation and Protected Plans Program; Policy and Planning Program; Communication and Outreach Program. For this internship, the student consultant will be mainly working with the Program Manager, Lolita Gibbons-Decherong, of the Conservation and Protected Plans Program. The Conservation Officer of the program, Meangeldil Azuma-Malsol will also serve as another point of contact throughout the summer. These teams are led by Dr. Sinton Soalablai who is the Interim Director of the organization.

Currently, there are 9 employees working in the main office. All 9 employees have access to computer applications either through desktops or laptops. The main applications that are used by employees

include Google applications (Gmail, Google Drive, etc.) and Microsoft Office applications (Word, Excel, Powerpoint, etc.). All employees are proficient with these programs and are able to sufficiently complete their tasks. Most of their proficiency in these tools comes from their experience. There aren't any formal training programs that are offered in the organization. The finance officer utilized PeachTree, an accounting software, to conduct financial tasks. However, the finance officer has now left PCS and the organization is looking for a replacement. Furthermore, the employees conduct a great amount of their work through formal papers and physical folders. As the organization grows, the inefficiencies of this method are becoming more apparent. The main concern raised by Mrs. Gibbons-Decherong is the loss of data and confusion that arises without a central platform that records all their important data. For instance, some older data are often hard to access as they are in physical forms. Therefore, it would be ideal for the staff to have an accessible central platform in which they can store all their work.

Technology Infrastructure

The technology infrastructure of the PCS is not complex. All employees have access to the internet whether through their desktop or laptops. They also have mobile phones at their disposal when they have tasks out in the field. For the Communications and Outreach team specifically, they are equipped with high end cameras in order to take images of conservation sites that are used for their personal data, but also promotional events and websites that support their outreach initiatives. There has been no indication of problems in the technology that hinder their daily operations. The issue that has been raised is more so in the area of effective technology usage. The organization needs assistance in methods to better organize information and to utilize the available technology.

Technology Management

There is no single member that is responsible for technology management. Resolving technical issues is usually done on a program basis. If staff members face technical issues, they consult the program manager or other staff members of their team to resolve the issue. If technical issues require professional assistance or additional purchases, this is consulted to the program manager who makes the decision on how to resolve the issue.

Technology Planning

There is an efficient system that is used by the organization for budgeting and purchases of new technology. The program manager is first allocated a certain budget for each project by the Finance Officer. This budget is then signed by the Director of PCS and the Program Manager. Any technological needs that come up during the projects are budgeted directly from the project budget. The budgets for projects usually have a separate amount designated for purchasing additional resources, however, the decisions are mostly under the Program Manager's discretion. If additional finances are needed for technology related purchases, the Program Manager communicates the needs to the Finance Officer and the Director.

Communication

Information sharing takes multiple forms in the organization. The first is simply through person-person communication and sharing of hard documents. Information online is communicated through mediums such as Google Email, Google Drive, and Messenger. All staff members also have access to their organization email accounts which are utilized for any business-related communication.

For communicating with donors and individuals with inquiries, the website lists the organization's phone number, administrative email address, and email addresses of each individual staff member. Furthermore, donors are added to the organization's quarterly newsletter along with a final report that is sent out annually. The website in general is very well organized and rich in information. The organization is also fairly receptive when communicating by phone.

Overall, the organization has not seen extreme challenges in regards to day-to-day communication both internally and externally.

Information Management

The first information that is critical to the organization is donor information. Specifically for the Conservation and Protected Areas department, their information is collected in Excel forms, Word documents, and hard documents. The first critical information collected by this department is background information on all conservation and protected areas in Palau. This information is collected through an application referred to as a "scorecard" in Excel. The scorecard includes the following information:

- List of protected areas
- Ecosystems and species that exist in the respective area
- Location of the protected area
- Terrestrial mass and marine mass of the area
- PAN Fund membership status of the area

The second critical information that is collected by the CPA department is the MPAME assessment tool which is used to assess and rate the management structure of protected areas. This information is also stored in an Excel spreadsheet. The final critical information collected by the CPA is a list of marine species that are protected at a state or national level. This information has recently been transferred to an Excel spreadsheet, however, there is some missing data as a lot of the information is scattered across different hard and online documents. Overall, while the necessary information is fairly well organized in spreadsheets, there is no centralized platform that organizes all this information. Furthermore, the information seems to be scattered across different online and hard documents which make the department more susceptible to information loss and confusion.

There is a lack of specificity on how information is collected and maintained in other departments. However, there does not appear to be a streamlined structure that is used to collect information that is uniform across all departments. This makes it challenging to share information across departments. Furthermore, some staff members have experienced information loss and confusion within departments due to the lack of cohesion. By enhancing the management of information, the organization could see benefits in both operations and programs. Firstly, information sharing between departments could be done more efficiently, thus beneficial to the organization's projects. While each program has different projects and missions, there is data that could be shared between programs. Furthermore, better information management adds value to the organization as a whole as they will be able to provide data and research that could be valuable for governments and other organizations.

Business Systems

The finances and budgeting were mainly managed by the past Finance Officer Ms. Lei Nagata. However, she has now left the organization and the organization is in the process of finding a new

Finance Officer. Until now, accounting has been done through an accounting software called Peachtree. This includes management of donations, payments, payrolls, taxes, budgeting for projects and resources, and other business operations.

Donations by individuals are initially collected through their website which directs interested donors to PayPal. PCS also has an allotment program for organizations hoping to become Corporate Partners with the PCS. The Corporate Partner membership is acquired through a minimum donation of \$1000 annually. Different from individual donations, this allotment program can be done by directly contacting the organization.

Overall, there have been no issues raised in regards to the business systems of the organization. There is a system in place that the next Finance Officer can follow.

II. Enhance and organize protected areas data

Motivation

While the current version of the spreadsheet is fairly organized, there are some areas that require revision. There are two parts to this solution. The first part is making edits to the current version of the scorecard. For instance, the column that describes the ecosystems and species of respective protected areas needs to be normalized for the staff to utilize Excel tools that could read that column as a proper input.

Ecosystems or species included
Atoll forests, Bird Sanctuary, Marine Areas
Atoll island, reefs, lagoon
Barrier reef
Atoll island, reefs, lagoon
Bekai Micronesia Megapode
Atoll forest
Atoll forest
Reefs, lagoon, terrestrial, islands
Groupers spawning aggregations
Mangrove
Mangrove
Forest, pond, watershed
Forest, stream, watershed
Mangrove and reef

Ecosystems or Species Column; Scorecard

This step would then increase the potential of the spreadsheet to be able to derive better graphs, calculations, and other depictions of the data. Another example that would be tackled in this step of the solution would be to transfer the color code index to its separate column.

Name	Ecosystems or species included	State(s)	Year estab.	Approximate Size	ESTIMATE ED	ESTIMATE D	Marine	Terrestrial	Mostly y	Mostly terrestri	PAN Memb
Special areas within Ngeremeduu Bay Conservation Area:											
Bulungui Conservation Area	Mangroves/Seagrass bed	Ngeremeduu	2006	0.71	0.71	0.00	x	x	x		
Bukalbeluu and Teuchel Miengui Conservation Areas	Northside of channel, reef	Ngeremeduu		0.30	0.30	0.00	x				
Mokod Recreation Zone	Reef	Ngeremeduu	2009	0.10	0.10	0.00					
Ngiwal Conservation Areas											
Oruxel Bushel	Reef/Clams	Ngiwal	2003/2015	0.67	0.67	0.00	x				2015
Chil (Isid)	Reef/Coral	Ngiwal	2003/2015	0.26	0.26	0.00	x				2015
Chiruki	Coral Reef	Ngiwal	2003/2015	0.32	0.32	0.00	x				2015
Aimelik Conservation Area											
Imul Mangrove Conservation Area	Mangrove	Aimelik	2002	0.43	0.43	0.00	x	x		x	
Ngerchabal	Island, reef flat	Aimelik	2006	0.30	0.30	0.00	x	x	x		
Ngerderrar Watershed Conservation Area, Aimelik CA's	Forest	Aimelik	2008	3.80	0.00	3.80					2011
Ngiwal Conservation Areas											
Ngiwal Conservation Area, Ngiwal CA's	Reef flat	Ngiwal	1997	1.00	1.00	0.00	x				2008
Chokkeek Watershed/Ngerbenau River Nature Reserve, Ngiwal CA	river	Ngiwal	2009	1.05	0.00	1.05		x		x	2008
Melekeek Conservation Areas											
Ngardok Nature Reserve, Melekeek*	Lake, wetlands, watershed, forest	Melekeek	1999	6.44	0.00	6.44		x			2008
Ngermedeem Marine Sanctuary*	Reef	Melekeek	2010	0.30	0.00	0.00	x				
Ngchesar Conservation Areas											
Ngeilik Conservation Area, Ngchesar CA's*	Patch reef	Ngchesar	2002	0.50	0.50	0.00	x				2011
Mesehelat Conservation Area, Ngchesar CA's*	watershed, forest	Ngchesar	2002	0.50	0.00	0.50		x			2008
Airai Conservation Areas											
Ngcheschang Mangrove Conservation Area*	Mangrove	Airai	1994	0.97	0.97	0.00	x				
Ngeraan Conservation Area*	Mangrove	Airai	1997	1.64	1.64	0.00	x				
Okilul Mangrove Conservation Area*	Mangrove	Airai	2002	0.78	0.78	0.00	x				
Medial Ngiwal Conservation Area, Airai CA's*	seagrass, coral reef, rock island	Airai	2006	3.18	3.17	0.11	x				2011
Koror State											
Rock Islands Southern Lagoon (RISL) Management Area	Rock Islands, lagoon, barrier reefs	Koror	1997	859.00	807.46	51.54	x	x	x		
Special areas within RISL Management Area:											
Ngerakud Islands Wildlife Preserve	Islands, reefs, lagoon	Koror	1956	11.40	10.64	0.80	x	x		x	2013
Ngeremeseel Spawning Area	Grass spawning aggregations	Koror	1976	3.50	3.50	0.00	x				2013
Ngeleel Sandree Sanctuary	Mangrove, sardine aggregation	Koror	1999	0.05	0.05	0.00	x	x	x		
Ngederrak Reef	Seagrass bed, reef flat	Koror	2007	5.98	5.98	0.00	x				
Ngerabesang Conservation Zone	Reef flat	Koror	2002	0.04	0.04	0.00	x				
Ngeremeseel Island Complex	Islands, reef, dive sites	Koror	1999	40.96	39.46	1.50	x	x	x		
Long Island Conservation Area	Limestone Forest, reefs	Koror	2012	0.38							
Titiluu Conservation Area	Seagrass bed, reef flat	Titiluu	2007	0.78	0.78	0.00	x				2012
Anguar Conservation Area*	Seagrass, reef flat	Anguar	2006	0.39	0.39	0.00	x				
Fana Island Important Bird Area (IBA)	Island	Sonsorol	Traditional decree	0.40	0.40	0.00		x			2012
Halen Reef Reserve	Atoll island, reefs, lagoon	Hatohobei	2001	171.05	171.00	0.05	x	x	x		2009
YELLOW, state PA networks											
GREEN, PAN Membership Acquired											
BLUE, multiple states combined with co-management											
Unshaded Sites = Non-PAN Sites											
					**PCS LISTING, UPDATED SEP2018						

Figure 1.1
Current color coded sheet; Scorecard

While it is not a challenge to understand what each color represents, it is harder to grasp the holistic view of how many protected areas fall under the category for each color (i.e., Green: PAN membership acquired). It would become more vital to revise this aspect of the data as more protected areas are added to the list.

With the first part of the solution perfecting the basic framework of the scorecard, the second part of the solution would be focused on additions and enhancement of its abilities. Firstly, the consulting partner sees numerous potential additions that could be made to the scorecard. For instance, the score ratings from the MPAME Assessment tool could be included in the scorecard so that members of the CPA division could have instant access to that information. Furthermore, existing tools such as pivot tables could be utilized to simplify the extensive data. This would be extremely helpful for the CPA when communicating with other divisions of the organization or entities that they need to collaborate with outside of the organization.

These two approaches will solve multiple aspects of the problem area. Firstly, by revising the framework of the data being collected, the data will be better organized. This makes the CPA and the organization as a whole less susceptible to data-related errors. Second, it centralizes relevant data into the scorecard to provide a holistic view of protected areas in Palau. This would not only benefit the members of the organization, but it will also benefit stakeholders working with the organization. The main issues that the organization faced were the lack of organization and centralization of the information it collected over the years. This also limits the organization's capabilities on how these data could be used. By resolving this problem area the organization will be better equipped to uphold the increasing value of their work in the country.

Other methods were considered for this goal. One of the initial ideas was to create an actual database system from platforms such as Microsoft Access and MongoDB. Introducing tools such as Airtable that would organize all communication of data and information was also considered. However, at the organization's current stage and capacity, it would be most efficient to utilize a much more simple and familiar tool. Oftentimes, these new technology systems could further hinder the organization's

capabilities without proper consideration. While utilizing these technologies is not completely off the table, the priority would be to set the basic framework within the scopes of Excel.

Outcomes

Clean up of protected areas data

The first step to enhancing the protected areas data was to clean and normalize the data. This would essentially prepare the data to be utilized to its maximum potential. The student consultant spent a week going through the data tables and ensuring that any quantitative data were accurate and that any qualitative data was normalized. Occasionally, the student consultant had to consult his partner and other members of the team in order to find any clarifications.

The first area of the data that needed cleaning up was the “Ecosystems and Species” information (see Appendix A). The issue with this qualitative data was that it wasn’t normalized. For instance, some cells would indicate the existence of coral reefs in the area with the term “Coral Reef”, while other cells would indicate the same characteristic with the term “Coral Reefs”. The inconsistency in diction across these cells would make it difficult to use some Excel’s features such as the filter tool. In order to normalize this data, the student consultant first collected a list of ecosystem and species terms from his partners. Using this guide, he made the terms consistent throughout the “Ecosystems and Species” column as shown in the table below. In result, different Excel tools could now be utilized to analyze the respective data

Ecosystems or species included
Coral Reef (Barrier Reef); Channels; Spawning & Aggregation Sites (MPAs); Forest (Atoll forest)
Island (Atoll island); Coral Reef; Lagoon
Coral Reef (Barrier Reef)
Island (Atoll island); Coral Reef; Lagoon
Bekai Micronesian Megapode; Bird Sanctuary
Forest (Atoll forest)
Forest (Atoll forest)
Coral Reef; Lagoon; Terrestrial; Island
<i>Grouper spawning aggregations</i>
Mangrove
Mangrove
Forest; Pond; Watershed
Forest; Stream; Watershed
Mangrove; Coral Reef
Mangrove; Coral Reef (Reef Flat); Seagrass bed
Coral Reef (Patch Reef)
Forest; Mountain vista
Waterfall
Upper Watershed; River; Forest

Figure 1.2

Normalized data; Final Scorecard

The second area that needed cleaning was the color coded rows as seen on Figure 1.1. While this color coded system would visually help identify the different status of each protected area, it would be challenging to conduct any analysis based on the data using the different tools in Excel. Therefore, the student consultant transferred this information to a separate column (see Appendix B), which would then allow tools such as the filter to organize/extract the data based on the status of the protected area.

The final major area that needed cleaning was the quantitative data that indicates the approximate sizes of the protected areas. Near the last few stages of working on the scorecard, the partner noticed that the approximate sizes needed to be converted to square meters in accordance with the data collected by The Office of the Palau Automated Land and Resource Information System (PALARIS). Due to the importance of having consistent data with PALARIS, the approximate size data and all respective sheets that utilized this data was converted from square kilometers to square meters.

Integration of Excel tools

With the data cleaned up and organized the student consultant could start integrating different tools that Excel has to offer in order to conduct analysis and make data organization easier.

Firstly, the student consultant started with basic items that could help with recording/editing data. These included drop down menus for columns that had limited variables. Through this, the global partner can conveniently record consistent data in the future. The student consultant also utilized the IF function for the column that indicated whether the protected area is “Mostly Terrestrial” or “Mostly Marine”. Based on the columns that give the numerical calculations of marine area and terrestrial area, the student consultant created this formula: =IF([@[ESTIMATED TERRESTRIAL (Sq.M)]]>[@[ESTIMATED MARINE (Sq.M)]], "Mostly Terrestrial", "Mostly Marine").

This would automate the process of labeling the protected area’s dominant characteristic.

The second item that was integrated to the scorecard was pivot tables. The student consultant and the team though pivot tables would be a great tool that could help summarize and analyze the extensive data. First, the student consultant completed the LinkedIn course on pivot tables to familiarize himself on the different attributes of the pivot table. Then, this tool was utilized to summarize the quantitative data related to the area’s size: Total area, marine area, and terrestrial area. It was important to extract this data to a separate tab on the spreadsheet for two reasons. First, it would simplify the analysis for the viewer by having a separate tab dedicated to size related information. Second, it would minimize any errors with the pivot tables from the other types of data it shouldn’t be analyzing.

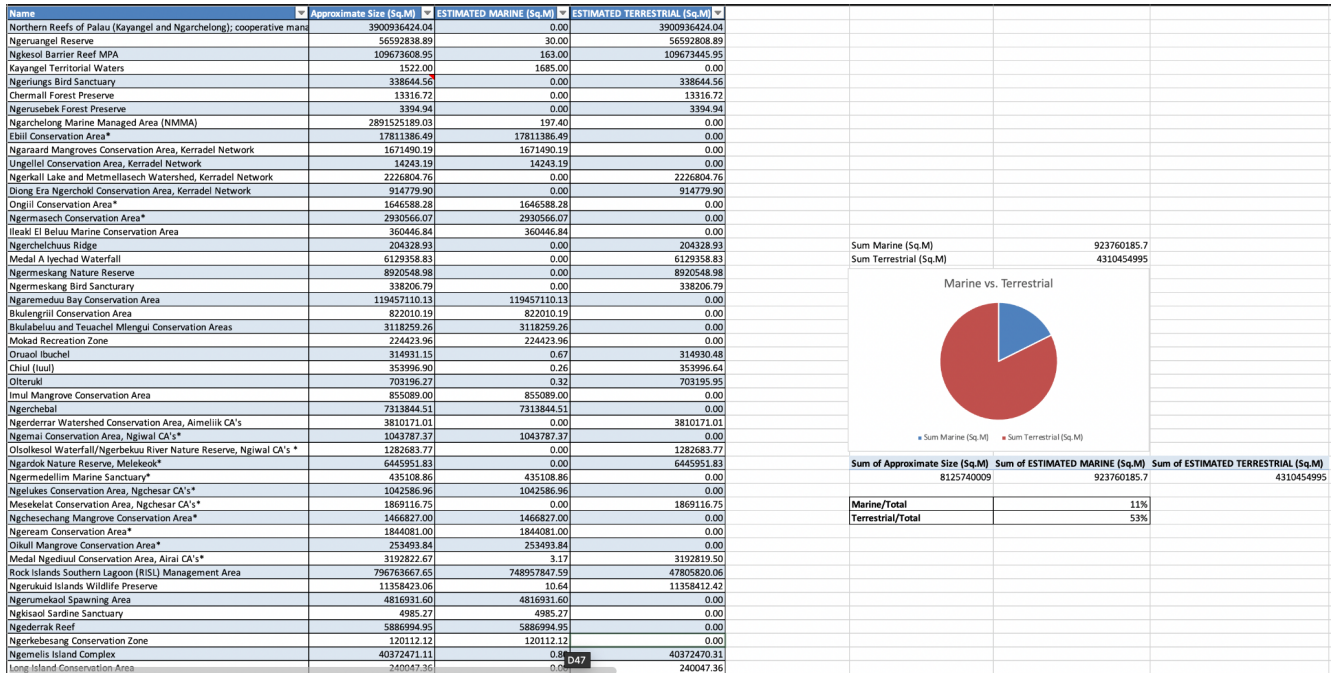


Figure 1.3

The result was the Excel tab seen above. Firstly, the tab included a table dedicated to organizing information on the area's quantitative information. Secondly, the tab has a pie graph and pivot table on the right that conducts relevant analysis of the data. The data on this tab is also linked to the main data sheet so that users do not have to make edits or additions to each tab when working on the data.

Thirdly, the student consultant saw a lot of potential with the species and ecosystems data. With the right tools, users would be able to get a general understanding of the area's ecosystems and species. Furthermore, users would be able to questions such as:

1. How many protected areas in Palau have a certain species in their ecosystem?
2. What is the most common species in the protected areas of Palau?
3. What species need extra attention from the organization?

Similar to the quantitative data, the species data was extracted to a separate tab. Next, the student consultant separated the data so that each species of a protected area would have their own row.

Name	Ecosystems or species included
Northern Reefs of Palau	Coral Reef (Barrier Reef)
Northern Reefs of Palau	Channels
Northern Reefs of Palau	Spawning & Aggregation Sites (MPAs)
Northern Reefs of Palau	Forest (Atoll forest)
Kayangel Protected Areas Network (KPAN)	Forest (Atoll forest)
Kayangel Protected Areas Network (KPAN)	Bird Sanctuary
Kayangel Protected Areas Network (KPAN)	Marine Areas
Ngaruangel Reserve	Island (Atoll island)
Ngaruangel Reserve	Coral Reef
Ngaruangel Reserve	Lagoon
Ngkesol Barrier Reef MPA	Coral Reef (Barrier Reef)
Kayangel Territorial Waters	Island (Atoll island)
Kayangel Territorial Waters	Coral Reef
Kayangel Territorial Waters	Lagoon
Ngeriungs Bird Sanctuary	Bekai Micronesia Megapode
Chermall Forest Preserve	Forest (Atoll forest)
Ngerusebek Forest Preserve	Forest (Atoll forest)
Ngarchelong Marine Managed Area (NMMA)	Coral Reef
Ngarchelong Marine Managed Area (NMMA)	Lagoon
Ngarchelong Marine Managed Area (NMMA)	Terrestrial
Ngarchelong Marine Managed Area (NMMA)	Island
Ebill Conservation Area*	Grouper spawning aggregations

Figure 1.4

As seen in figure one, the multiple ecosystems and species were separated so that they would have a cell for their own. This is also indicated by the repeating protected areas. This was a very important step to enhancing the utilization of this data. By separating the the ecosystems and species, Excel can now apply its filter tool. The filter tool, then, would be able to extract protected areas based on the ecosystems and species indicated by the user. This is demonstrated in the figure below, where all protected areas with a type of “Coral Reef” has been extracted.

Name	Ecosystems or species included
Northern Reefs of Palau	Coral Reef (Barrier Reef)
Ngaruangel Reserve	Coral Reef
Ngkesol Barrier Reef MPA	Coral Reef (Barrier Reef)
Kayangel Territorial Waters	Coral Reef
Ngarchelong Marine Managed Area (NMMA)	Coral Reef
Ongiil Conservation Area*	Coral Reef
Ngermasech Conservation Area*	Coral Reef (Reef Flat)
Ileaki El Beluu Marine Conservation Area	Coral Reef (Patch Reef)
Bkulabeluu and Teuachel Mlengui Conservation Areas	Coral Reef
Mokad Recreation Zone	Coral Reef
Oruaol Ibuchel	Coral Reef
Chiul (Iuul)	Coral Reef
Ngerchebal	Coral Reef (Reef Flat)
Ngemai Conservation Area, Ngiwal CA's*	Coral Reef (Reef Flat)
Ngermedellim Marine Sanctuary*	Coral Reef
Ngelukes Conservation Area, Ngchesar CA's*	Coral Reef (Patch Reef)
Medal Ngediul Conservation Area, Airai CA's*	Coral reef
Rock Islands Southern Lagoon (RISL) Management Area	Coral Reef (Barrier Reef)
Ngerukuid Islands Wildlife Preserve	Coral Reef
Ngederrak Reef	Coral Reef (Reef Flat)
Ngerkebesang Conservation Zone	Coral Reef (Reef Flat)
Ngemelis Island Complex	Coral Reef
Long Island Conservation Area	Coral Reef
Teluleu Conservation Area*	Coral Reef (Reef Flat)
Angaur Conservation Area*	Coral Reef (Reef Flat)
Helen Reef Reserve	Coral Reef

Figure 1.5

The “Species” tab also holds a pivot table that would give the quantitative summaries of how many locations have a certain type of species or ecosystem.

Integration of MPAME Assessments

The final component to the solution was to somehow bring in MPAME Assessments into the Scorecard. The MPAME Assessments are individual excel sheets that score the protected areas in categories such as, biophysical, legal, socio-economic, etc. Furthermore, these MPAME assessments hold descriptive information on the protected areas such as, contact information, location, establishment date, status, etc. Therefore, it was determined that it would be effective to have these information integrated into one master file. The individual MPAME assessments were added as separate sheets in the Scorecard file. These sheets included a condensed version of the MPAME assessments, to highlight the most important information.

PA Background		PAME ASSESSMENT RESULTS	
Name of Protected Area	Ngardok Nature Reserve (MP's Term: 2011-2014)	MC	Average of Score
Location of Protected Area	Melekeok State	Biophysical	17%
Date PA was established	31-Dec-97	Conservation effect	86%
Ownership details	Melekeok State Government	Ecosystem services	0%
Management authority	Office of the Governor	Enforcement	78%
Contact information	Tel: 654-2967/2728 E-Mail: melekeokgov@gmail.com	Finance	13%
Size of Protected Area (sq.km)	Est. 6.44 km2	Infrastructure/equip	67%
Percent of PA that is marine/terrestrial (%)	100% Terrestrial	Legal	73%
Number of staff (temp, permanent or volunteer)	15	Planning	92%
Annual budget	\$132,540.72	Socio-economic	58%
Designation (PAN, IUCN category, Ramsar, etc.)	PAN Use Category: Ramsar Site, IUCN Category:	Staffing	92%
Date of previous score card assessment		Stakeholder engagement	76%
		Traditional knowledge	100%
		Grand Total	72%
Master List Hyperlink			

Figure 1.6

Firstly, this sheet included general information on the protected area as shown in the table above. Furthermore, it outlines the ratings that the protected area received in each category, along with a bar graph that visualizes the scores. These sheets, then, were hyperlinked to the names of the protected areas that are listed in the main table (Appendix B). This would allow the user to easily access more detailed information on the protected area while working on the main table. This integration allows users to focus on one excel file, rather than having to open 30+ excel sheets when utilizing the data of these protected areas.

Recommendations

Based on your analysis of outcomes, what concrete recommendations can you offer to help them sustain their progress and continue to increase their capacity?

Why should they implement this recommendation? Provide a persuasive argument for why the recommendation is important. If the argument is that it would support their mission better, quantify how “better” would be measured (e.g. cost savings or via Return on Investment (ROI)). Or if the argument is for more efficient use of resources (people or funds), quantify how “more efficient” would be measured, e.g. time saved, money saved, or ROI. Think in terms of the same type of concrete evidence that you presented in your Outcomes analysis.

What steps should they follow to implement each recommendation? Give concrete activities at a level appropriate for the CP to understand and be able to implement.

What resources will help them implement those recommendations? Why are these resources useful? How should they use them to implement the recommendation?

Clear Roles and Working Procedure

For this newly modified Scorecard to be maintained, it is important that a clear procedure is planned out on how to update/modify data. It is expected that in the coming years, there will be additional protected areas and changes to the existing protected areas. It is important that these changes are accurately recorded to the Scorecard. This will allow the Scorecard to produce accurate analysis based on the data recorded. For instance, both the partner and consultant are aware that the approximate marine/terrestrial data is not accurate. This will strongly hinder the tools that are associated with the "Size" sheet. Therefore, it is strongly recommended that these data drawbacks are addressed quickly.

Furthermore, it is recommended that the partner outlines the steps and roles that other staff members adhere to when working with the sheet. For instance, it is expected that there will be changes to the MPAME assessments over time. The partner should derive who will be transferring the data from individual MPAME sheets to the Scorecard. One suggestion would be to add a sheet to the Scorecard that logs who updated the data, how the data was updated, and when the data was updated. A sample time log template is displayed below.

Name	Date	Location	Changes Made
Consultant	9/1/2021	"Size" Sheet	Changed the variables in the pivot table

Figure 1.7

Most importantly, this structure needs to be discussed and agreed upon by all staff members that will be working on this spreadsheet. It is important that all users are aware and comfortable with the procedure that will be followed.

MPAME Assessment

One of the data that the student consultant enjoyed working with were the MPAME Assessments. The consultant sees great potential by having such comprehensive assessments of each protected area. The consultant would recommend that the survey and rating system is transferred to a different platform than the excel sheets that it is currently in. While excel can be useful in working with the collected ratings and information, it is definitely not the most convenient software for the actual collection portion of the process. Since the MPAME Assessment forms are already in Google Sheets, the student consultant would recommend the partner to make use of Google Forms to organize the questionnaires of the MPAME Assessments. This would make it easier for the staff members of PCS to collect information in the field. Furthermore, the platform will automatically transfer the data to the Excel file in which the data can be analyzed and refined. By making the collection of MPAME assessments easier and more efficient, the consultant hopes that PCS will be able to more frequently update the MPAME assessments to track the progress each protected area is making. Once there is enough data in regards to the MPAME assessments, the Scorecard file can also be utilized to, not only

outline the current status of protected areas, but to track the improvements that the protected areas have been making based on the changing ratings.

About the Consultant

Curtis Lee is a junior in Policy and Management with a second major in Chinese Studies and a Minor in Societal and Human Impacts of Future Technologies (SHIFT) at Carnegie Mellon University. He will be taking part in the Technology Consulting in the Global Community internship over the summer and return in the fall to continue his studies.

Appendix A

Ecosystems or species included
Coral Reef, Channels, Spawning & Aggregation Sites (MPAs), Atoll Forests, Barrier Reefs
Atoll forests, Bird Sanctuary, Marine Areas
Atoll island, reefs, lagoon
Barrier reef
Atoll island, reefs, lagoon
Bekai Micronesian Megapode
Atoll forest
Atoll forest
Reefs, lagoon, terrestrial, islands
<i>Grouper spawning aggregations</i>
Mangrove
Mangrove
Forest, pond, watershed
Forest, stream, watershed
Mangrove and reef
Mangrove, reef flat, seagrass bed
Patch reef
Forest, Mountain vista
waterfall
Upper Watershed, river, forest
Swamp forest, forest
Estuary, mangroves
<i>Mangroves/Seagrass bed</i>
<i>Northside of channel, reef</i>
<i>Reef</i>
<i>Reef/Clams</i>

Appendix B

Name	Ecosystems or species included	State(s)	Year established	Approximate Size (Sq M)	ESTIMATED MARINE (Sq M)	ESTIMATED TERRESTRIAL (Sq M)	Marine	Terrestrial	Moody/Marine/Terrestrial	PAN Member	Status
Northern Reefs of Palau (Koror and Ngardmang); cooperative management island between the 3 states; Memorandum of Agreement entered into in 2014 for agreement to cooperate and 2017 for agreement to cooperate in implementation of Northern Reefs Fisheries Management Plan and Northern Reefs Rules and Regulations.	Coral Reef (Barrier Reef); Chamaeleon; Spermatophyte Aggregation Sites (SPAS); Forest (Atoll forest)	Co-Management: Koror and Ngardmang State	2014 (Memorandum of Agreement entered into between the 3 states)	36000620.04		36000620.04			Moody Terrestrial	With exception of Ngardmang Bird Sanctuary, all other sites are members of the PAN	Co-managed / State PA
Ngaraujan Reserve	Island (Atoll Island); Coral Reef; Lagoon	Koror	1996	695208.89	31.00	695208.89	x	x	Moody Terrestrial	2011	PAN Member
Nakomal Marine Reef MPAs	Coral Reef (Barrier Reef)	Koror	2012	1060208.90	160	1060208.90	x		Moody Terrestrial	2013	State PA
Kaungat Limestone Islands	Island (Atoll Island); Coral Reef; Lagoon	Koror	2012	1522.00	1695	1522.00	x		Moody Marine	2013	PAN Member
Ngargung Bird Sanctuary	Bikai Micronesian Maggot; Bird Sanctuary	Koror	2012	33964.56	0.00	33964.56	x		Moody Terrestrial		
Chemical Forest Preserves	Forest (Atoll forest)	Koror	2012	13316.72	0.00	13316.72	x		Moody Terrestrial		
Ngaraujan Forest Preserves	Forest (Atoll forest)	Koror	2012	3384.34	0.00	3384.34	x		Moody Terrestrial		
Ngardmang Marine Mangrove Area (NMMMA)	Coral Reef; Lagoon; Terrestrial; Island	Ngardmang	2014	2891025.09 (0)	197.40	0.00	x	x	Moody Marine	2013	State PA
Chil Conservation Area*	Group; Savanna aggregation	Ngardmang	1999	1781126.49	0.00	1781126.49	x		Moody Marine	2008	PAN Member
Ngardmang Mangrove Conservation Area; Kircardin Network	Mangrove	Ngardmang	1994	1677430.19	0.00	1677430.19	x		Moody Marine	2011	PAN Member
Ngardmang Conservation Area; Kircardin Network	Mangrove	Ngardmang	2007	1424.16	0.00	1424.16	x		Moody Marine	2011	PAN Member
Merchall Lake and Merchallach Watershed; Kircardin Network	Forest; Pond; Watershed	Ngardmang	2008	222604.76	0.00	222604.76	x	x	Moody Terrestrial	2011	PAN Member
Dong En; Ngardmang Conservation Area; Kircardin Network	Forest; Stream; Watershed	Ngardmang	2008	614776.90	0.00	614776.90	x		Moody Terrestrial	2011	PAN Member
Chil Conservation Reef*	Mangrove; Coral Reef	Ngardmang	2010	1466048.28	0.00	1466048.28	x		Moody Marine		
Ngardmang Conservation Area*	Mangrove; Coral Reef (Reef Flat); Seagrass bed	Ngardmang	2006/07	200566.07	0.00	200566.07	x		Moody Marine	2010	PAN Member
Belei (I) Bay Marine Conservation Area*	Coral Reef (Patch Reef)	Ngardmang	2005	303446.84	303446.84	0.00	2010	2010	Moody Marine	2010	PAN Member
Ngardmang Ridge	Forest; Mountain ridge	Ngardmang	2005	204208.03	0.00	204208.03	x		Moody Terrestrial	2010	PAN Member
Medal A Yeched Waterfall	Waterfall	Ngardmang	2005	612028.83	0.00	612028.83	x		Moody Terrestrial	2010	PAN Member
Ngardmang Nature Reserve	Upper Watershed; River; Forest	Ngardmang	2008	600566.86	0.00	600566.86	x		Moody Terrestrial		
Ngardmang Bird Sanctuary	Swamp; Forest; Forest	Ngardmang	2008	33026.79	0.00	33026.79	x		Moody Terrestrial		PAN Member
Ngardmang Bay Conservation Area	Estuary; Mangrove	Ngardmang; Ngardmang; Amelik	1999	11946715.13	11946715.13	0.00	x		Moody Marine		
Biological Conservation Area	Mangrove; Seagrass bed	Ngardmang	2005	62010.16	0.00	62010.16	x		Moody Marine		
Bkububud and Teuchel Mangrove Conservation Area	Northside of channel; Coral Reef	Ngardmang	2008	3116269.26	3116269.26	0.00	x		Moody Marine		
Mikol Reservation Zone	Coral Reef	Ngardmang	2008	224423.96	224423.96	0.00			Moody Marine		
Orad Beach	Coral Reef; Crabs	Ngardmang	2003/2015	214931.75	0.00	214931.75	x		Moody Terrestrial	2019	
Chil (Isal)	Coral Reef; Crabs	Ngardmang	2003/2015	30396.90	0.00	30396.90	x		Moody Terrestrial	2015	
Chilak	Coral Reef	Ngardmang	2003/2015	707165.27	0.00	707165.27	x		Moody Terrestrial	2015	
Inul Mangrove Conservation Area	Mangrove	Amelik	2002	80006.00	80006.00	0.00	x		Moody Marine		PAN Member
Ngardmang	Island (Rock Island); Coral Reef (Reef Flat)	Amelik	2006	731364.51	0.00	731364.51	x		Moody Marine		
Ngardmang Watershed Conservation Area; Asuwel CA; Ngardmang Conservation Area; Ngardmang CA*	Forest	Amelik	2008	381011.01	0.00	381011.01	x		Moody Terrestrial	2011	PAN Member
Ngardmang Conservation Area; Ngardmang CA*	Coral Reef (Reef Flat)	Ngardmang	1997	1043787.37	1043787.37	0.00	x		Moody Marine	2008	PAN Member
Island Waterfall (Ngardmang River Ngardmang Reserve; Ngardmang CA)	River	Ngardmang	2009	120261.77	0.00	120261.77	x		Moody Terrestrial	2008	PAN Member
Ngardmang Nature Reserve; Kircardin Network*	Lake; Wetland; Waterweed Forest	Ngardmang	1998	645661.83	0.00	645661.83	x		Moody Terrestrial	2008	PAN Member
Ngardmang Marine Sanctuary*	Coral Reef	Ngardmang	2008	431108.86	431108.86	0.00	x		Moody Marine	2008	PAN Member
Ngardmang Conservation Area; Ngardmang CA*	Coral Reef (Patch Reef)	Ngardmang	2002	104208.96	0.00	104208.96	x		Moody Marine	2011	PAN Member
Ngardmang Conservation Area; Ngardmang CA*	Waterweed Forest	Ngardmang	2002	169116.75	0.00	169116.75	x		Moody Terrestrial	2008	PAN Member
Ngardmang Mangrove Conservation Area*	Mangrove	Amelik	1994	146927.00	0.00	146927.00	x		Moody Marine		
Ngardmang Conservation Area*	Mangrove	Amelik	1997	184425.00	0.00	184425.00	x		Moody Marine		
Okul Mangrove Conservation Area*	Mangrove	Amelik	2002	233493.84	0.00	233493.84	x		Moody Marine		
Medal Ngardmang Conservation Area; Ngardmang CA; Ngardmang Conservation Area	Seagrass bed; Coral Reef (Rock Island)	Amelik	2008	319626.07	3.17	319629.24	x		Moody Terrestrial	2011	PAN Member
Rock Islands Southern Lagoon (RSL); Ngardmang Area	Island (Rock Island); Lagoon; Coral Reef (Barrier Reef)	Amelik	1997	7867867.25	7867867.25	4799263.06	x		Moody Marine		State PA
Ngardmang Wildlife Preserve	Island (Rock Island); Coral Reef; Lagoon	Amelik	1995	1135842.06	1026	1135842.42	x		Moody Terrestrial	2013	PAN Member
Ngardmang Seagrass Area	Shallow seagrass aggregation	Amelik	1978	401623.60	0.00	401623.60	x		Moody Marine		PAN Member
Ngardmang Sandbar Aggregation	Mangrove; Sandbar aggregation	Amelik	1987	4865.27	0.00	4865.27	x		Moody Marine		
Ngardmang Reef	Seagrass bed; Coral Reef (Reef Flat)	Amelik	2007	569994.95	0.00	569994.95	x		Moody Marine		
Ngardmang Conservation Zone	Coral Reef (Reef Flat)	Amelik	2002	20171.12	0.00	20171.12	x		Moody Marine		
Ngardmang Island Complex	Island (Rock Island); Coral Reef; Diverse sites	Amelik	1995	4037471.11	0.00	4037470.31	x		Moody Terrestrial		
Long Island Conservation Area	Limestone Forest; Coral Reef	Amelik	2012	24047.36	0.00	24047.36	x		Moody Terrestrial		
Talib Conservation Area*	Seagrass bed; Coral Reef (Reef Flat)	Amelik	2007	24036.28	0.00	24036.28	x		Moody Marine		
Angar Conservation Area*	Seagrass bed; Coral Reef (Reef Flat)	Amelik	2008	111947.47	111947.47	0.00	x		Moody Marine	2012	PAN Member
Ngardmang Reef Reserve	Island (Atoll Island); Coral Reef; Lagoon	Hakobul	2001	10674368.11	171.00	10674368.17	x	x	Moody Terrestrial	2009	PAN Member