TECHNOLOGY CONSULTING
IN THE GLOBAL COMMUNITY

Final Consulting Report

Palau PALARIS

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Carnegie Mellon University

cmu.edu/tcingc

Palau Automated Land and Resource Information System (PALARIS) Executive Summary

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I. About the Organization

Under Palau Executive Order 381, Palau Automated Land and Resource Information System, or PALARIS, is trusted to:

1. Develop, maintain, update and distribute geographic information, technology, data and services for use by national agencies, state governments and the public;
2. Coordinate all geographic information activities in national and state governments, and shall collect, manage and distribute geographic information maintained by state agencies and local government agencies;
3. Provide technical services related to geographic information to national agencies and state governments;
4. Set standards for the acquisition, management, and reporting of geographical information, and the acquisition, creation or use of applications employing such information, by any national agency or state government;
5. Promote awareness among national agencies and state governments on the use of geographical information to support decision making processes; and
6. Serve as Secretariat for Implementation of Executive Order 350 reconstituting the National Environmental Protection Council (NEPC).

PALARIS is the primary government office responsible for collecting, processing, and analyzing geographic data. This data is distributed to federal, state, public, and private entities to make informed decisions concerning space and resources.

The office has seven (7) full-time staff members. It is led by the Community Partner, David Idip, who is the Chief of Staff. The office pays for an Esri license that allows fifty (50) account users. Each staff member has experience working with Arc Map, the predecessor to ArcGIS Pro. Esri is rapidly integrating ArcGIS Pro with other programs, including ArcGIS Dashboards, StoryMaps, Experience Builder, etc. Therefore, several staff members are transitioning their work from Arc Map to Pro so they can use more of the integrated programs. This transition is useful in the long term because it will make sharing and presenting data more seamless.

PALARIS has adequate storage and network connection. All full time staff members have access to three servers, which are backed up, so there is no immediate concern about data being lost or corrupted. The office mainly runs on Windows, and internet connection is generally reliable.

PALARIS currently lacks a platform (website) for sharing information externally. Residents and other entities generally call or walk into the office to request data. This is fine for local residents and entities, but this becomes a burden to persons or entities far from Palau. The office has expressed interest in launching a data hub that they can directly manage.

II. Goal: Launch a Public Data Hub and Interactive Platform

PALARIS did not previously have a website for external users. This means all data and information requests were processed via phone, email, or walk-in. Residents regularly walk in or call to requesting boundary files. By launching a public data hub, users have easier access to geospatial data and PALARIS staff members have more time for other tasks.

A link to the PALARIS website can be found at https://www.palaugov.pw under Services and the heading “Palau Maps/GIS”. Right now, the PALARIS website URL is a clunky string of letters and numbers. The IT Chief of Staff for the Ministry of Finance says he will customize the URL so that it is easier to remember. Fortunately, users can scroll to the footer at the bottom of the PALARIS website and click the chain link emoji, which will display a shortened URL: https://arcg.is/5vrCu.

III. Recommendations

The staff at PALARIS should record a message that directs callers to the website for all data requests. This message should include brief directions for how to access the PALARIS website via the government website (https://www.palaugov.pw). It should conclude with a statement that tells the user to stay on the line if they have a non-data related request or need. This way, the number of data requests via phone calls should decrease. This message should take little time to record and can be done by any of the staff.

In addition, The Community Partner and two staff members with editing permissions should lead a follow-up training session with the other staff to practice uploading data and editing content in the website. This way, everyone in the office would have a baseline understanding of updating the website in case the main staff members tasked with its upkeep are not present. This training could be accomplished in as little as one (1) hour-long meeting.

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Saul graduated with a Master of Science in Public Policy and Management this May, 2024.

Palau Automated Land and Resource Information System (PALARIS) Final Consulting Report

Student Consultant, Saul Bezner
Community Partner, David Idip

I. About the Organization

Organization

Palau Automated Land and Resource Information System, or PALARIS, is the official geospatial office of the Republic of Palau. It is the primary government office responsible for collecting, processing, and analyzing geographic data. This data is distributed to federal, state, public, and private entities to make informed decisions concerning space and resources.

PALARIS has a staff of seven (7) full-time employees. These civil servants work with a variety of entities from the Office of Statistics, which oversees the Palau Housing and Community survey, to non-government organizations like the Palau Conservation Society.

Facilities

PALARIS is located in a building between the Department of Corrections and the Bureau of Lands and Surveys. The office is designed as an open workspace where staff members can see and speak to each other, which fosters teamwork and collaboration. Each staff member has a computer that possesses significant random access memory and storage, which is important considering the large and cumbersome nature of geospatial data.

Its only apparent technological problem is consistent electricity. The Republic of Palau experiences periodic black outs. Luckily, several PALARIS staff members have computer towers that run on backup electricity in the case of blackouts, and ArcGIS Pro projects can be saved and edited up to one hour after losing account connection.

Programs

PALARIS works on several important projects. The office collects and cleans remote sensing data for shoreline, wildfire, soil, and land use analysis. This data is also used to update elevation and bathymetry files, which are used by several government agencies for planning purposes. The office is also currently naming every road and addressing every building in the country. This work will improve mail delivery and other time sensitive needs. The office is also responsible for mapping and distributing information concerning the boundaries of conservation and protected areas.

Staff

PALARIS has seven (7) full-time staff members. David is the Chief of Staff. He guides the office, directing projects towards long term goals. Taka is the office manager who oversees daily tasks and analyzes remote sensing data. Ophelia works in collaboration with GEF6, a related government program, which partners with state legislatures to protect Palau's natural resources. Darlynne, Jacquie, and Neil work on cadastral data, standardizing street names and address numbering for the

nation. Rodney collects and cleans drone imagery, which is used internally and externally for purposes including, but not limited to, shoreline, wildfire, soil, and land use analysis.

PALARIS pays for an Esri license that allows fifty (50) account users. Each staff member has experience working with Arc Map, the common predecessor to ArcGIS Pro. Esri is rapidly integrating ArcGIS Pro with other programs, including ArcGIS Dashboards, StoryMaps, Experience Builder, etc. Therefore, several staff members are transitioning their work from Arc Map to Pro so they can use more of the integrated programs. This transition is useful in the long term because it will make sharing and presenting data more seamless.

Technology Infrastructure

PALARIS has adequate storage and network connection. All full time staff members have access to a server, which is backed up, so there is never worry about data being lost or corrupted. The office mainly runs on Windows, and internet connection is generally reliable. Perhaps the only difficulty facing the office is naming and organizing files in a standard manner. This proposal will elaborate on naming and organizing files in a later section.

Technology Management

PALARIS falls under the administration of the Ministry of Finance, which has an IT team. There are generally few problems with backing up data, installing software, or updating virus definitions. The IT support team appears to be a small, but reliable, staff that is called on as needed.

Technology Planning

The Community Partner plans and budgets technology updates. There doesn't appear to be an immediate need for coordinated technology planning.

Communication

PALARIS can share information internally through their ArcGIS Online account thanks to the license they have. Staff members may choose to share files via external hard drives, however, because geospatial data is large and Esri operates on a credit system whereby using account storage slowly reduces credits. One benefit of sharing files internally via physical hard drives is that it ensures data security: external hard drives rarely, if ever, leave the office.

PALARIS currently lacks a platform (website) for sharing information externally. Residents and other entities generally call or walk in to the office to request data or information. This is fine for local residents and entities, but this becomes a burden to persons or entities far from Palau. The office has expressed interest in launching a data hub that they can directly manage.

Information Management

The office has three servers and cloud storage, which staff members can use to share and backup files. The office also uses email for day-to-day communication. David is interesting in transitioning all finished (cleaned and processed) files to the ArcGIS Online account for easy access and distribution with other government offices. The office can achieve this by creating different online groups and distributing any of their thirty plus (30+) remaining unused accounts.

Business Systems

The Ministry of Finance has an accounting team that supports all payroll and business transactions for PALARIS. All accounting and business activities go through accounting.

II. Goal: Launch a Public Data Hub and Interactive Platform

Motivation

PALARIS did not previously have a website for external users. This meant all data and information requests were processed via phone, email, and walk-ins. Data sharing therefore took time and energy that staff could have otherwise used for projects. Residents and organizations regularly call or walk into the office, requesting shoreline files. A public data hub will increase user accessibility and reduce the number of walk-ins, thus freeing up staff to focus on short and long term projects.

In addition to automating the data request process, a website will function as a platform for informing the public and addressing frequently asked questions. For example, several government offices, private partners, NGOs, and community groups are interested in visualizing census data. A website can easily host dashboards or other data visuals that share population statistics. These dashboards can show any number of variables from the Palau census, including demographic, economic, and health indicators. Furthermore, by sharing data publicly, residents and other entities will be free to perform their own analysis.

Outcomes

The website link has been added to the list of Services at https://www.palaugov.pw under Palau Maps/GIS. (See Appendix A to view the website layout, or click on the shortened URL below.) The link works and is easy to access from the government website. One drawback is the URL shown once a user opens the PALARIS website: it's a clunky string of letters and numbers. The IT Chief of Staff for the Ministry of Finance says he will customize the URL so that it is easier to remember. Fortunately, users can scroll to the footer at the bottom of the PALARIS website and click the chain link emoji, which will display a shortened URL: https://arcg.is/5vrCu. A new shortened link is generated every time the website is reloaded, and each is functional in perpetuity.

In addition to the website, the Consultant wrote a series of four (4) standard operating procedures (SOPs) to guide the PALARIS staff when naming files, reformatting tables, matching colors, and exporting content to ArcGIS Online (see Appendix B). All documentation was saved to one of three PALARIS servers.

PALARIS staff also attended four (4) training sessions led and recorded by the Consultant. These trainings were interactive sessions where staff members could ask questions and troubleshoot issues with the site. The Consultant then answered questions and reconfigured aspects of the website. All trainings and related materials were saved to the same server as the SOPs.

There remains one small but significant risk to sustainability. Website editing permission is granted by the license administrator, the Community Partner. This is good because it prevents other staff from accidentally editing the website or hosted apps and materials. However, if the license administrator does not grant sufficient editing permission to staff members, website updates could fall behind. There are currently two other staff members who have editing permission. Fortunately,

there are two training videos explaining (1) how to configure the website and (2) add downloadable data in case a new staff members is trusted with editing.

III. Recommendations

Record Message that Directs Users to Website for All Data Requests

The staff at PALARIS should record a message for callers that directs them to the website for all data requests. This message should include brief directions for how to access the PALARIS website via the government website (https://www.palaugov.pw). It should conclude with a statement that tells the user to stay on the line if they have a non-data related request or need. This way, the number of data requests via phone calls should decrease. This message should take little time to record and can be done by any of the staff.

Have Staff Members Practice Adding Data to the Website

In addition, The Community Partner and two staff members with editing permissions should lead an follow-up training session with the other staff to practice uploading data and editing content in the website. This way, everyone in the office would have a baseline understanding of updating the website in case the main staff members tasked with its upkeep are not present. This training could be accomplished in as little as one (1) hour-long meeting.

About the Consultant

Saul recently graduated with a Master of Science in Public Policy and Management from Carnegie Mellon University. His research focuses on the intersection of geospatial analysis and the social determinants of health. He took part in the Technology Consulting in the Global Community internship after graduating and is now pursuing work in geographic information systems.

Appendix A

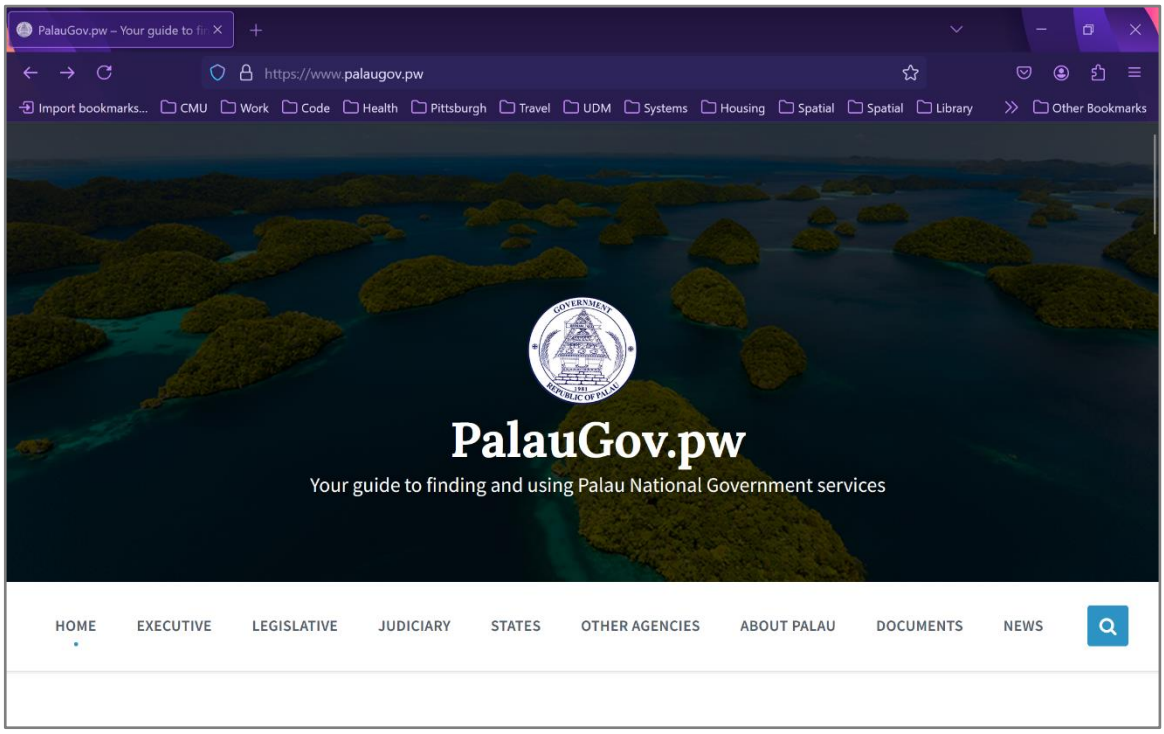


Image 1. Users go to https://www.palaugov.pw to access the PALARIS website.

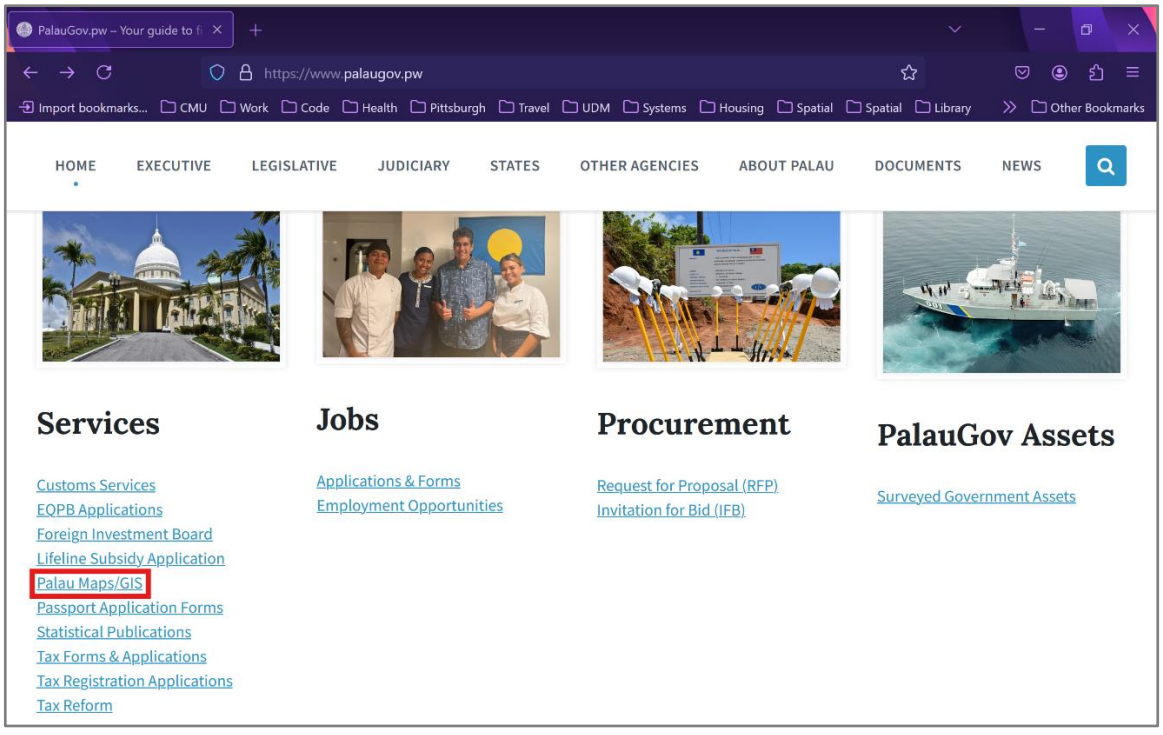


Image 2. Users scroll down to Services and select “Palau Maps/GIS”.

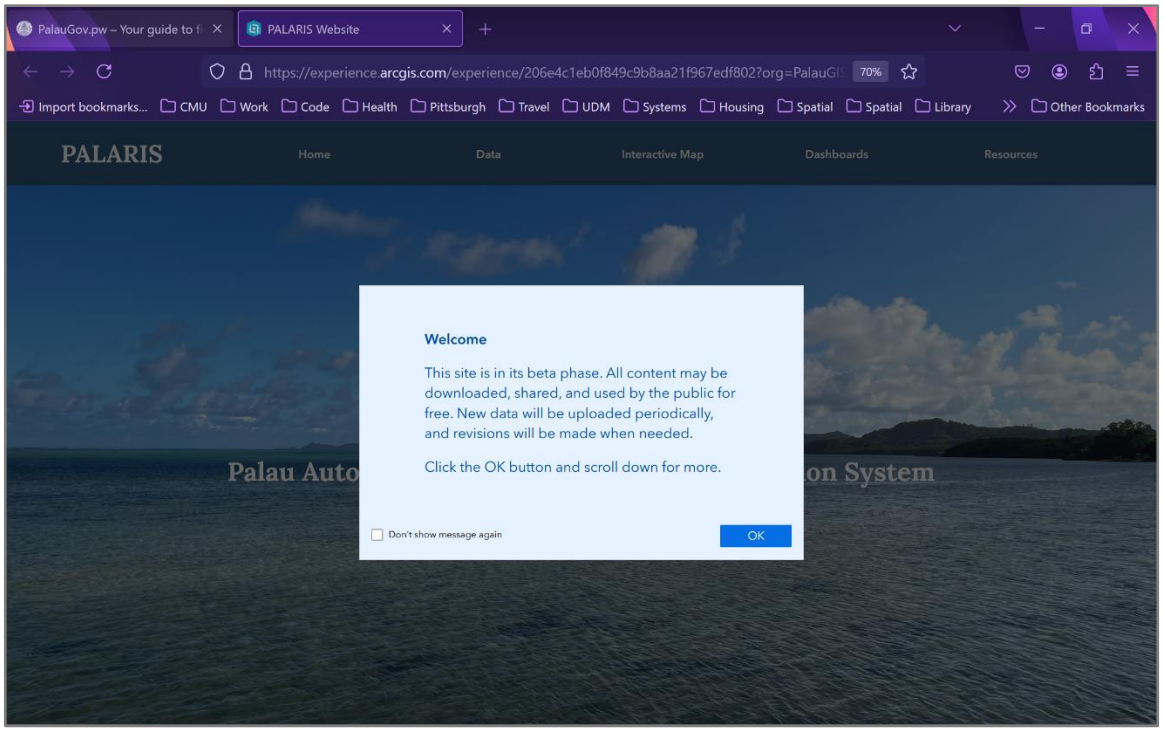


Image 3. Users are introduced to the Home page by a pop up window.

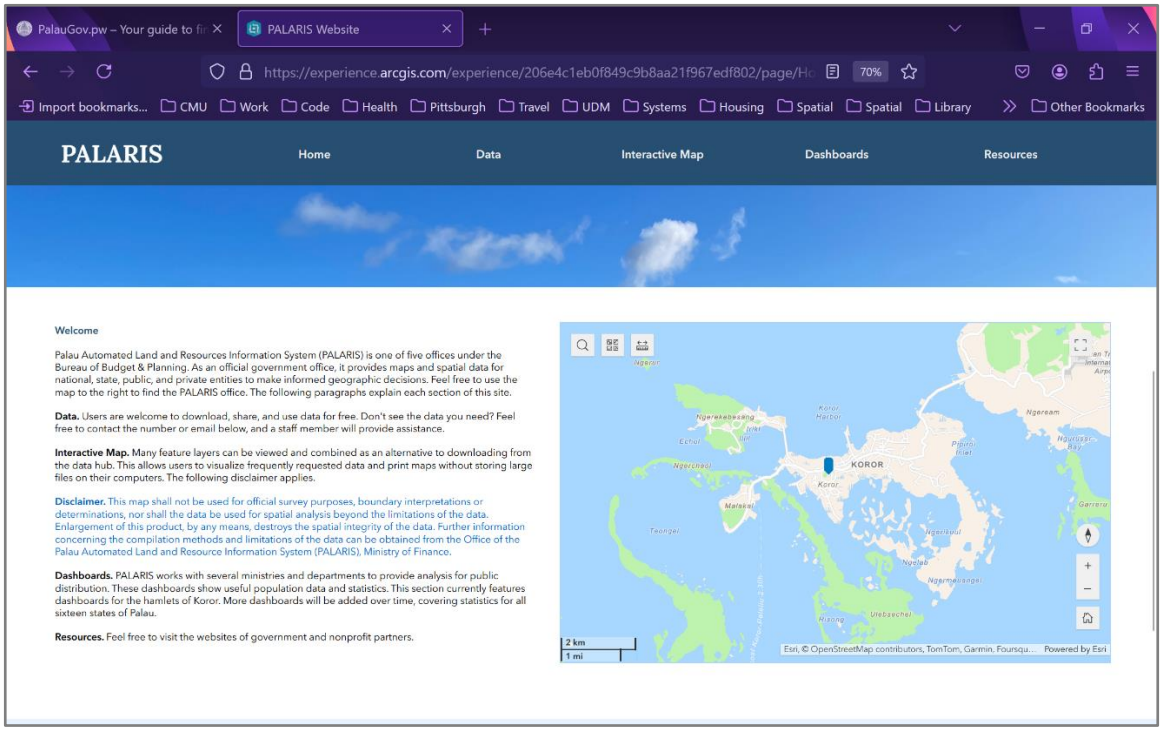


Image 4. Users scroll down to read more about PALARIS and the website pages.

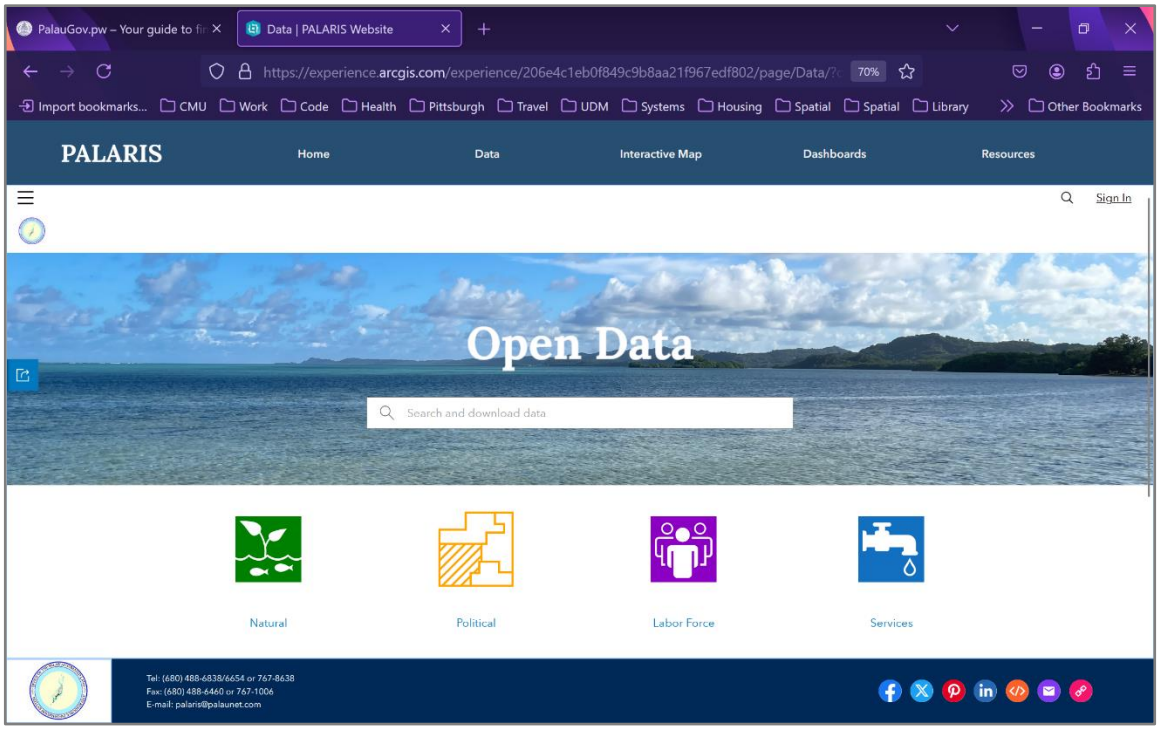


Image 5. Users can click on the Data page to search and download geospatial data.

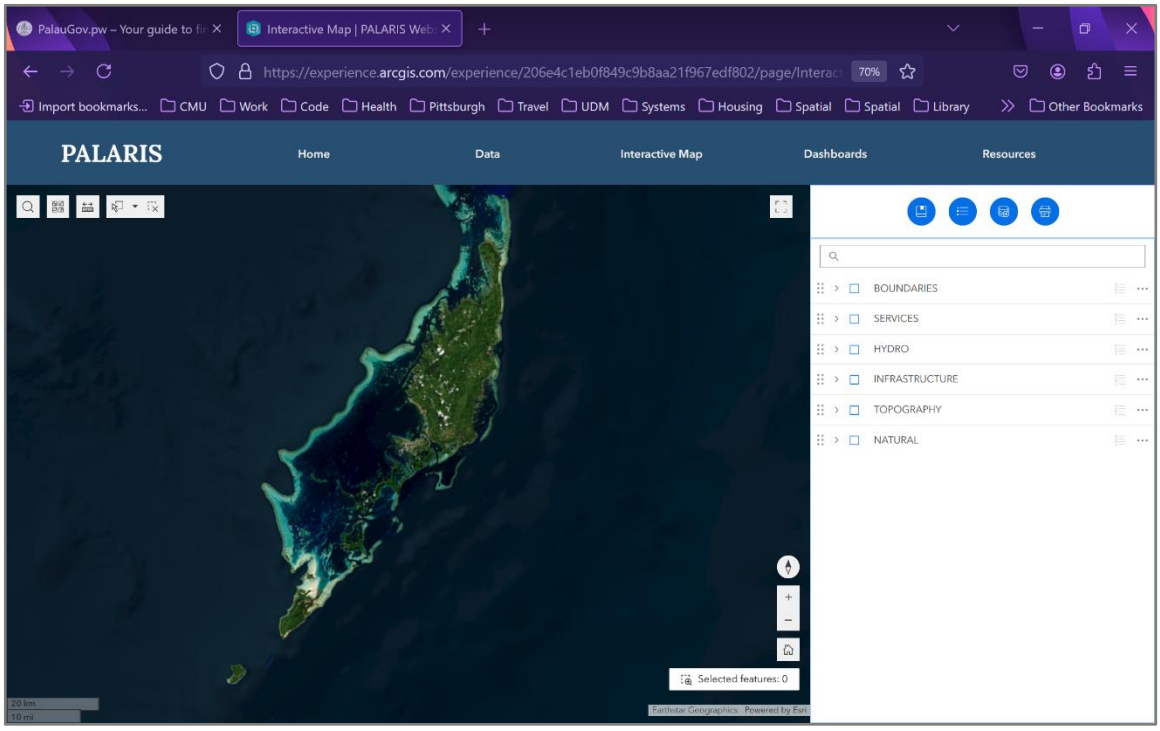


Image 6. Users can click on the Interactive Map to add hosted feature layers from the list on the right side of the screen.

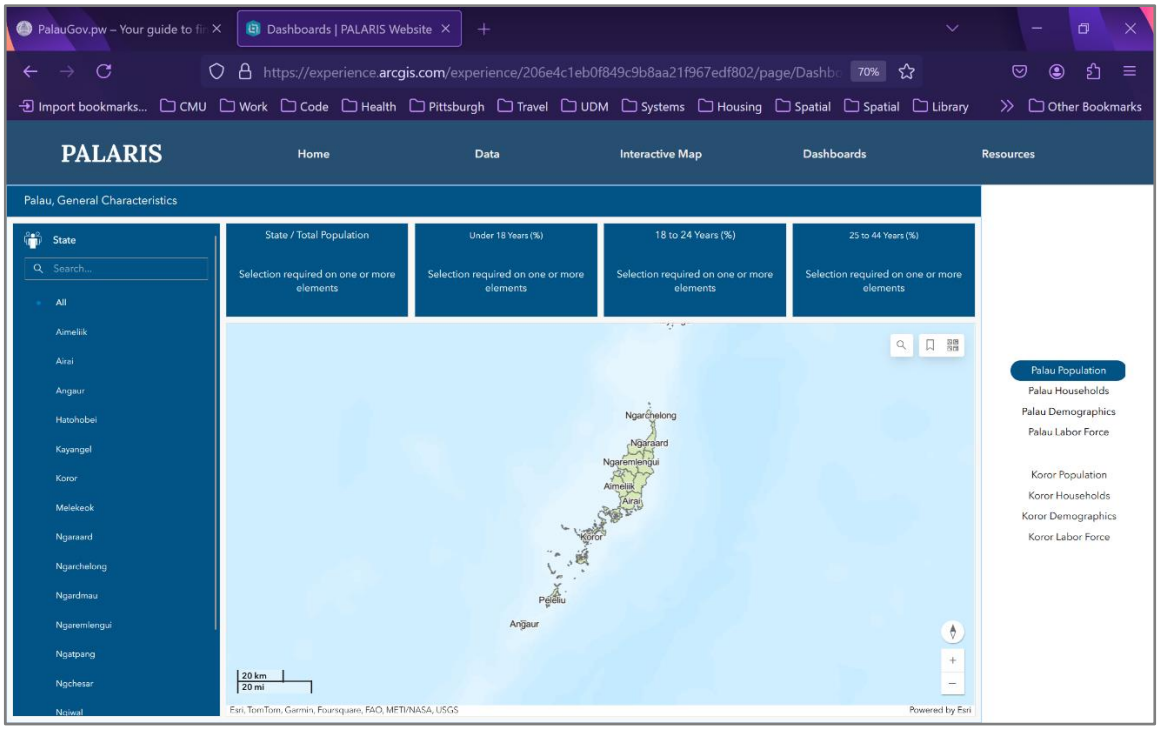


Image 7. Users can click on the Dashboards tab to view statistics from the Palau Census of Population and Housing.

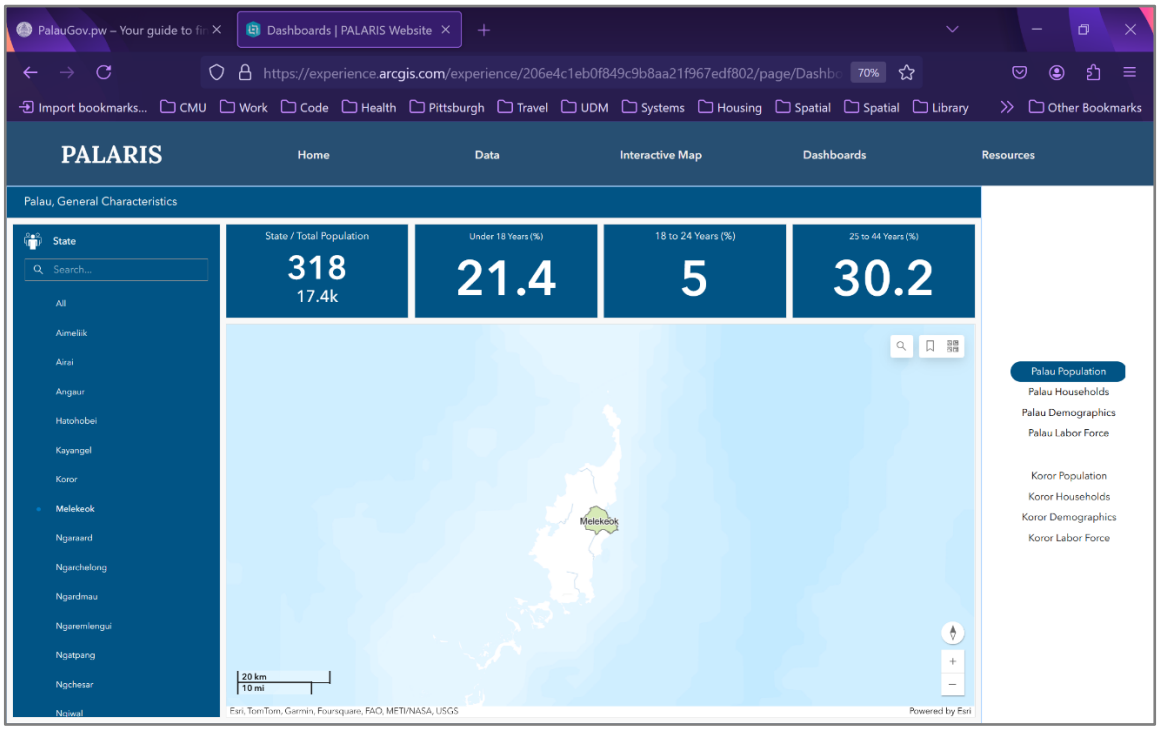


Image 8. Users can select a specific state from the category bar on the left, which will highlight that state and show related statistics.

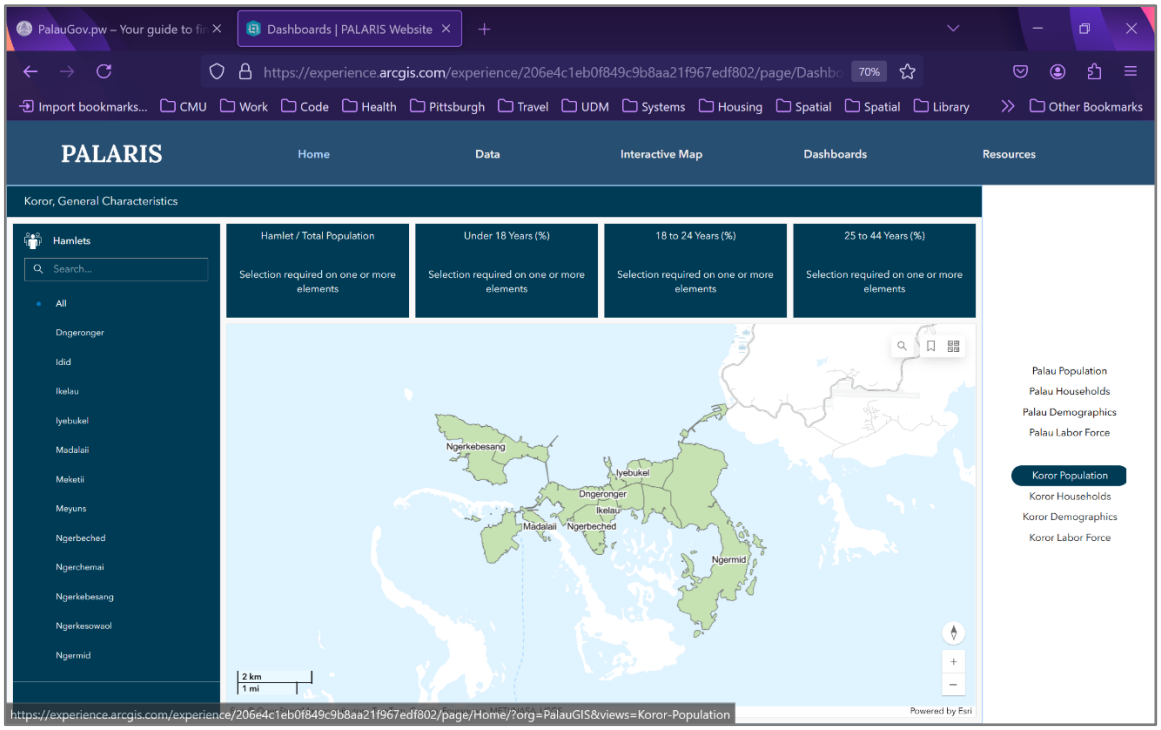
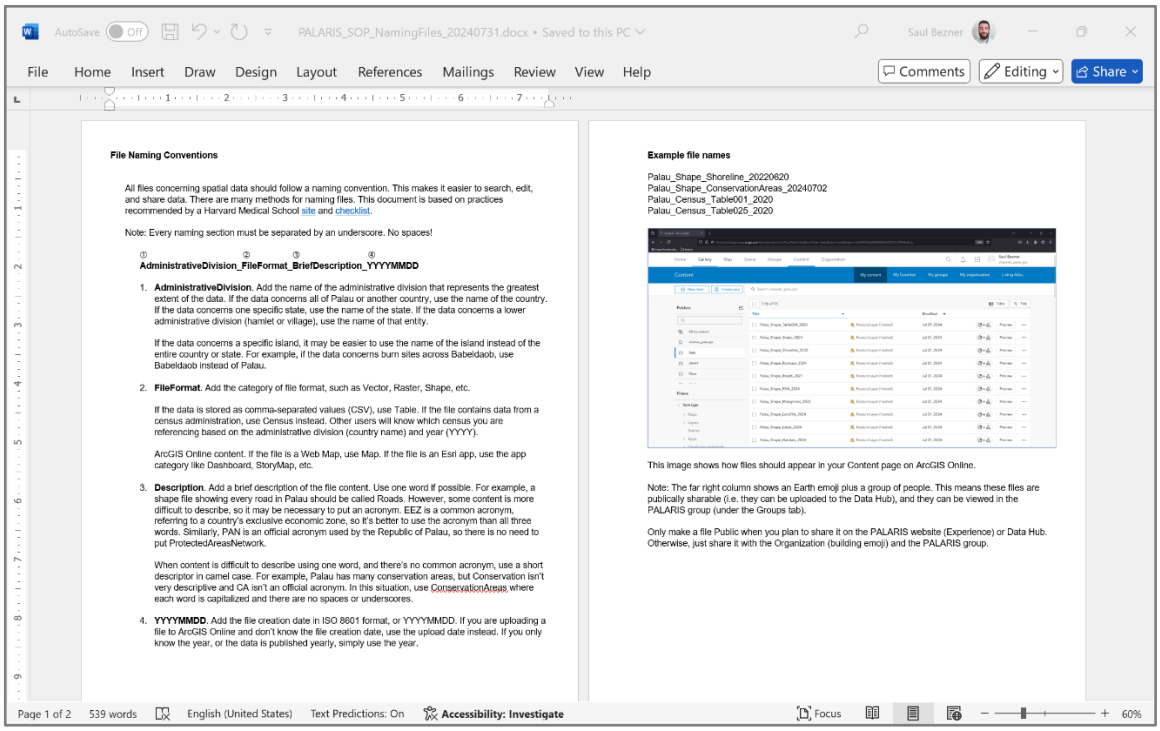


Image 9. Users can select state or hamlet (Koror) level statistics by clicking the list on the right side of the page.

Appendix B



File Naming Conventions

All files concerning spatial data should follow a naming convention. This makes it easier to search, edit, and share data. There are many methods for naming files. This document is based on practices recommended by a Harvard Medical School site and checklist.

Note: Every naming section must be separated by an underscore. No spaces!

① ② ③ ④
AdministrativeDivision_FileFormat_BriefDescription_YYYYMMDD

1. **AdministrativeDivision**. Add the name of the administrative division that represents the greatest extent of the data. If the data concerns all of Palau or another country, use the name of the country. If the data concerns one specific state, use the name of the state. If the data concerns a lower administrative division (hamlet or village), use the name of that entity.

   If the data concerns a specific island, it may be easier to use the name of the island instead of the entire country or state. For example, if the data concerns burn sites across Babeldaob, use Babeldaob instead of Palau.

2. **FileFormat**. Add the category of file format, such as Vector, Raster, Shape, etc.

   If the data is stored as comma-separated values (CSV), use Table. If the file contains data from a census administration, use Census instead. Other users will know which census you are referencing based on the administrative division (country name) and year (YYYY).

   ArcGIS Online content. If the file is a Web Map, use Map. If the file is an Esri app, use the app category like Dashboard, StoryMap, etc.

3. **Description**. Add a brief description of the file content. Use one word if possible. For example, a shape file showing every road in Palau should be called Roads. However, some content is more difficult to describe, so it may be necessary to put an acronym. EEZ is a common acronym, referring to a country's exclusive economic zone, so it's better to use the acronym than all three words. Similarly, PAN is an official acronym used by the Republic of Palau, so there is no need to put ProtectedAreasNetwork.

   When content is difficult to describe using one word, and there's no common acronym, use a short descriptor in camel case. For example, Palau has many conservation areas, but Conservation isn't very descriptive and CA isn't an official acronym. In this situation, use ConservationAreas where each word is capitalized and there are no spaces or underscores.

4. **YYYYMMDD**. Add the file creation date in ISO 8601 format, or YYYYMMDD. If you are uploading a file to ArcGIS Online and don't know the file creation date, use the upload date instead. If you only know the year, or the data is published yearly, simply use the year.

Example file names

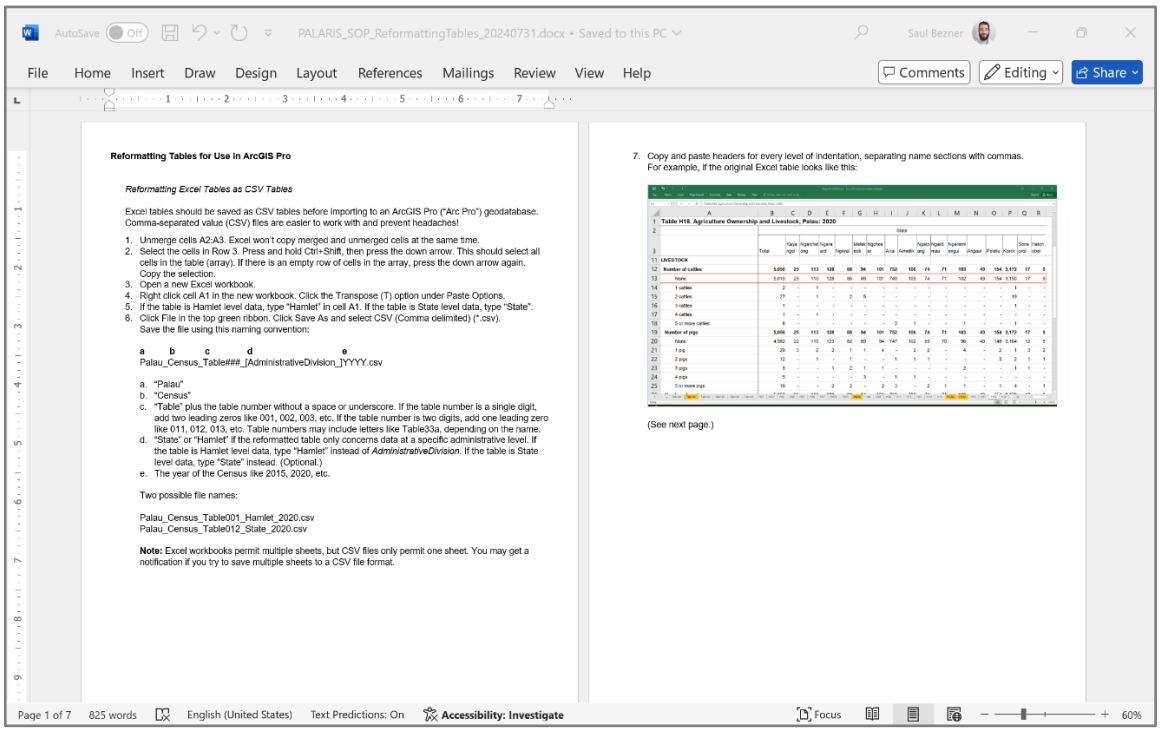
Palau_Shape_Shoreline_20220820
Palau_Shape_ConservationAreas_20240702
Palau_Census_Table001_2020
Palau_Census_Table025_2020

This image shows how files should appear in your Content page on ArcGIS Online.

Note: The far right column shows an Earth emoji plus a group of people. This means these files are publically sharable (i.e. they can be uploaded to the Data Hub), and they can be viewed in the PALARIS group (under the Groups tab).

Only make a file Public when you plan to share it on the PALARIS website (Experience) or Data Hub. Otherwise, just share it with the Organization (building emoji) and the PALARIS group.

Image 10. Two-page SOP concerned with file naming conventions.



Reformatting Tables for Use in ArcGIS Pro

Reformatting Excel Tables as CSV Tables

Excel tables should be saved as CSV tables before importing to an ArcGIS Pro ("Arc Pro") geodatabase. Comma-separated value (CSV) files are easier to work with and prevent headaches!

1. Unmerge cells A2:A3. Excel won't copy merged and unmerged cells at the same time.
2. Select the cells in Row 3. Press and hold Ctrl+Shift, then press the down arrow. This should select all cells in the table (array). If there is an empty row of cells in the array, press the down arrow again. Copy the selection.
3. Open a new Excel workbook.
4. Right click cell A1 in the new workbook. Click the Transpose (T) option under Paste Options.
5. If the table is Hamlet level data, type "Hamlet" in cell A1. If the table is State level data, type "State".
6. Click File in the top green ribbon. Click Save As and select CSV (Comma delimited) (*.csv). Save the file using this naming convention:

   a b c d e
   Palau_Census_Table###_[AdministrativeDivision_]YYYY.csv

   a. "Palau"
   b. "Census"
   c. "Table" plus the table number without a space or underscore. If the table number is a single digit, add two leading zeros like 001, 002, 003, etc. If the table number is two digits, add one leading zero like 011, 012, 013, etc. Table numbers may include letters like Table33a, depending on the name.
   d. "State" or "Hamlet" if the reformatted table only concerns data at a specific administrative level. If the table is Hamlet level data, type "Hamlet" instead of *AdministrativeDivision*. If the table is State level data, type "State" instead. (Optional.)
   e. The year of the Census like 2015, 2020, etc.

   Two possible file names:

   Palau_Census_Table001_Hamlet_2020.csv
   Palau_Census_Table012_State_2020.csv

   Note: Excel workbooks permit multiple sheets, but CSV files only permit one sheet. You may get a notification if you try to save multiple sheets to a CSV file format.

7. Copy and paste headers for every level of indentation, separating name sections with commas. For example, if the original Excel table looks like this:

Table H18. Agriculture Ownership and Livestock, Palau: 2020

(See next page.)

Image 11. First two pages of the SOP concerned with reformatting tables.

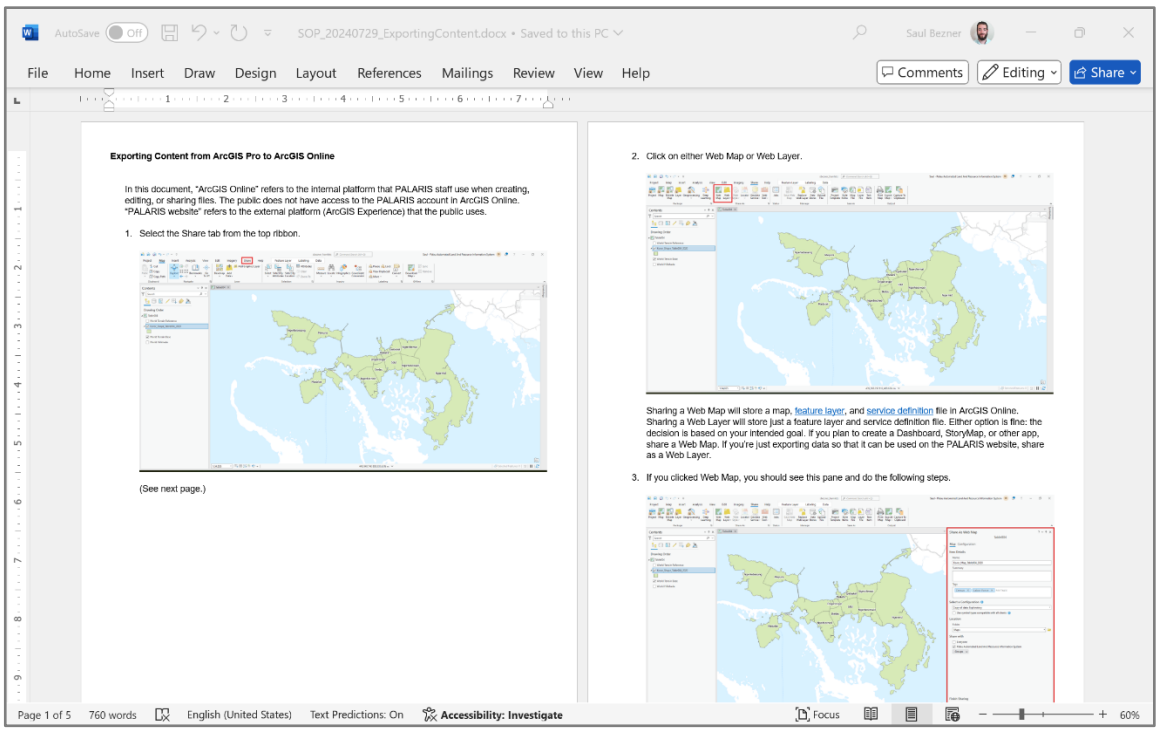


Image 12. First two pages of the SOP concerned with exporting content from ArcGIS Pro.

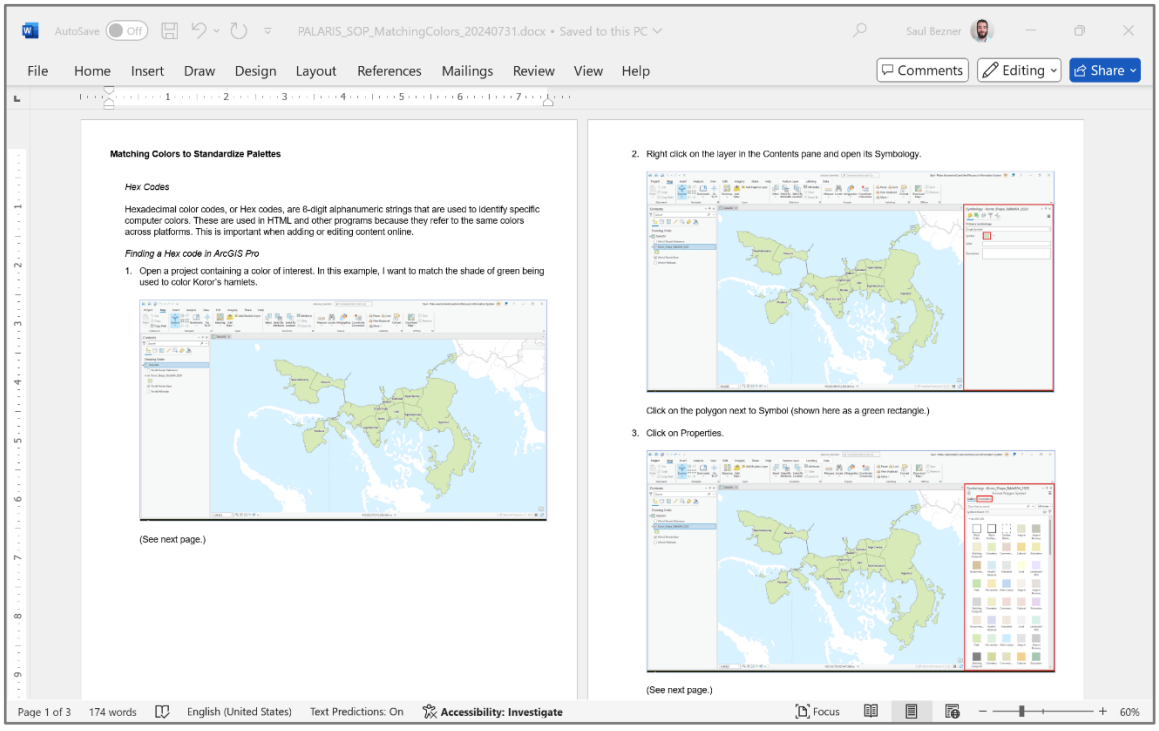


Image 13. First two pages from the SOP concerned with matching (standardizing) colors using hexadecimal color codes, or hex codes.